

Appendix K.

Contractor Checklist

For each report submitted to the UST Management Division, the contractor will be required to verify that all data elements for the required scope of work have been provided. For items not required for the scope of work, the N/A box should be checked. For items required and not completed or provided, the No box should be checked and a thorough description of the reason must be provided.

Item #	Item	Yes	No	N/A
1	Is Facility Name, Permit #, and address provided?	✓		
2	Is UST Owner/Operator name, address, & phone number provided?	✓	no phone # provided	
3	Is name, address, & phone number of current property owner provided?	✓		
4	Is the DHEC Certified UST Site Rehabilitation Contractor's Name, Address, telephone number, and certification number provided?	✓		
5	Is the name, address, telephone number, and certification number of the well driller that installed borings/monitoring wells provided?			✓
6	Is the name, address, telephone number, and certification number of the certified laboratory(ies) performing analytical analyses provided?			✓
7	Has the facility history been summarized?	✓		
8	Has the regional geology and hydrogeology been described?	✓		
9	Are the receptor survey results provided as required?			✓
10	Has current use of the site and adjacent land been described?	✓		
11	Has the site-specific geology and hydrogeology been described?	✓		
12	Has the primary soil type been described?	✓		
13	Have field screening results been described?			✓
14	Has a description of the soil sample collection and preservation been detailed?			✓
15	Has the field screening methodology and procedure been detailed?			✓
16	Has the monitoring well installation and development dates been provided?			✓
17	Has the method of well development been detailed?			✓
18	Has justification been provided for the locations of the monitoring wells?			✓
19	Have the monitoring wells been labeled in accordance with the UST QAPP guidelines?			✓
20	Has the groundwater sampling methodology been detailed?			✓
21	Have the groundwater sampling dates and groundwater measurements been provided?	✓	historic data	
22	Has the purging methodology been detailed?			✓
23	Has the volume of water purged from each well been provided along with measurements to verify that purging is complete?			✓
24	If free-product is present, has the thickness been provided?	✓	historic data	
25	Does the report include a brief discussion of the assessment done and the results?			✓
26	Does the report include a brief discussion of the aquifer evaluation and results?			✓
27	Does the report include a brief discussion of the fate & transport models used?			✓

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Item #	Item	Yes	No	N/A
28	Are the site-conceptual model tables included? (Tier 1 Risk Evaluation)			✓
29	Have the exposure pathways been analyzed? (Tier 2 Risk Evaluation)			✓
30	Have the SSTLs for each compound and pathway been calculated? (Tier 2 Risk Evaluation)			✓
31	Have recommendations for further action been provided and explained?	✓		
32	Has the soil analytical data for the site been provided in tabular format? (Table 1)		✓	
33	Has the potentiometric data for the site been provided in tabular format? (Table 2)	✓	historic data	
34	Has the current and historical laboratory data been provided in tabular format?	✓	historic data	
35	Have the aquifer characteristics been provided and summarized on the appropriate form?			✓
36	Have the Site conceptual model tables been included? (Tier 1 Risk Evaluation)			✓
37	Has the topographic map been provided with all required elements? (Figure 1)	✓		
38	Has the site base map been provided with all required elements? (Figure 2)	✓		
39	Have the CoC site maps been provided? (Figure 3 & Figure 4)	✓	GW only	
40	Has the site potentiometric map been provided? (Figure 5)	✓	historic map	
41	Have the geologic cross-sections been provided? (Figure 6)	✓	historic	
42	Have maps showing the predicted migration of the CoCs through time been provided? (Tier 2 Risk Evaluation)			✓
43	Has the site survey been provided and include all necessary elements? (Appendix A)			✓
44	Have the sampling logs, chain of custody forms, and the analytical data package been included with all required elements? (Appendix B)			✓
45	Is the laboratory performing the analyses properly certified?			✓
46	Has the tax map been included with all necessary elements? (Appendix C)			✓
47	Have the soil boring/field screening logs been provided? (Appendix D)			✓
48	Have the well completion logs, DHEC Form 2099, and DHEC Form 1903 been provided? (Appendix E)			✓
49	Have the aquifer evaluation forms, data, graphs, equations, etc. been provided? (Appendix F)			✓
50	Have the disposal manifests been provided? (Appendix G)			✓
51	Has a copy of the local zoning regulations been provided? (Appendix H)			✓
52	Has all fate and transport modeling been provided? (Appendix I)			✓
53	Have copies of all access agreements obtained by the contractor been provided? (Appendix J)			✓
54	Has a copy of this form been attached to the final report and are explanations for any missing or incomplete data been provided?	✓		



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Explanation for missing and incomplete information?

No sampling / field work was performed. Historic  
information was provided for reference.

Project Verifier (signature) Kimberly Phillips

(print name) Kimberly Phillips

Date 9-6-17

# **CORRECTIVE ACTION PLAN**

for

**81 FOOD MART, UST PERMIT #12458  
1502 EAST GREENVILLE STREET  
ANDERSON, ANDERSON COUNTY, SOUTH CAROLINA**

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Prepared for:

**SOUTH CAROLINA DEPARTMENT OF HEALTH AND  
ENVIRONMENTAL CONTROL**

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Prepared by:

**ENVIRORISK CONSULTANTS, INC.**  
*UST SITE REHABILITATION CONTRACTOR #428*



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**Issue Date: September 7, 2017**



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### **APPENDICES:**

#### **TABLES**

- Table 1 – Soil Analytical Data - *not applicable*
- Table 2/3 – Potentiometric and Laboratory Data (*historical*)
- Table 4 – Site Specific Target Levels
- Table 5 – Timeline (*text Section 4.6*)

#### **FIGURES**

- Figure 1 – Topographic Map
- Figure 2 – Site Base Map
- Figure 3 – Soil CoC Map- *not applicable*
- Figures 4A-4D – Groundwater CoC Map (*November 2016 data*)
- Figure 5 – Site Potentiometric Map (*June 20, 2016 data*)
- Figures 6A-6C – Geologic Cross Sections (*previous consultant*)
- Figure 7 – Proposed Treatment Plan

**APPENDIX A:** Site Survey- *not applicable*

**APPENDIX B:** Sampling Logs, Laboratory Data- *not applicable*

**APPENDIX C:** Tax Map- *not applicable*

**APPENDIX D:** Soil Boring/Field Screening Logs- *not applicable*

**APPENDIX E:** Well Completion Logs, Well Records- *not applicable*

**APPENDIX F:** Aquifer Evaluation Forms- *not applicable*

**APPENDIX G:** Disposal Manifests- *not applicable*

**APPENDIX H:** Local Zoning Regulations- *not applicable*

**APPENDIX I:** Fate and Transport Modeling- *not applicable*

**APPENDIX J:** Access Agreements- *not applicable*

**APPENDIX K:** Contractor Checklist

**UIC Permit Application**

**Site Specific Work Plan**

# CORRECTIVE ACTION PLAN

for

**81 FOOD MART, UST PERMIT #12458  
1502 EAST GREENVILLE STREET  
ANDERSON, ANDERSON COUNTY, SOUTH CAROLINA**

## GEOLOGY CERTIFICATION

I certify that I am a qualified ground-water scientist who has received a baccalaureate or post-graduate degree in the natural sciences or engineering, and have sufficient training and experience in ground-water hydrology and related fields, as demonstrated by state registration and completion of accredited university courses, that enable me to make sound professional judgments regarding ground-water monitoring and contaminant fate and transport. I further certify that this report was prepared by myself or by a subordinate working under my direction.



---

Kenneth C. Summerour, P.G. #2114  
Registered Professional Geologist

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9-7-17  
Date



## **1.0 INTRODUCTION**

This Corrective Action Plan (CAP) is being submitted for 81 Food Mart, UST Permit #12458, located at 1119 Cherokee Ave, Gaffney, South Carolina and Fast & Fresh 3, UST Permit #09530, located at 1502 East Greenville Street, Anderson, Anderson County, South Carolina (hereafter referred to as “the site” or “the facility”). The preparation of this CAP was authorized in Purchase Order (PO) #4600577312 for the release reported on November 10, 1992. This scope of work is being conducted for the South Carolina Department of Health and Environmental Control (SCDHEC).

This section outlines the purpose and content organization of the CAP along with a brief description of the site and surrounding properties.

### **1.1 Purpose**

The overall purpose of this CAP is to present a plan for corrective action in order to prevent further degradation of the aquifer by continued migration of petroleum constituents into areas not previously impacted. Envirorisk has developed a corrective action scope of work to treat the Area of Concern (AOC) which includes all wells with measurable free product and dissolved concentrations. Corrective action at this facility described under this PO includes removal of free product to <0.01 feet and reduction of chemicals of concentration (CoC) to Site Specific Target Levels (SSTLs) as shown on **Table 4**. Historical data including water levels and analytical results are provided in **Table 2/3**.

All tables, figures, and other supplemental material referenced in the text are provided in the labeled appendices. Some tables, diagrams, etc. are provided in the body of the text for ease of reference.

### **1.2 Property Owner**

The responsible property for UST #12458 is Brent Puzak with Circle K, and the mailing address is 305 Gregson Drive, Cary, NC, 27511. The phone number was not provided. The current property owner is Labtech Diagnostics, LLC, and their mailing address is 1502 East Greenville Street, Anderson, SC 29621 (same as the site address). The phone number is 864-760-0039.

### **1.3 Description of Site and Surrounding Properties**

The site is currently operating as Labtech Diagnostics located on the south side of East Greenville Street at the intersection of McLees Road in Anderson, South Carolina. The site previously operated as a gasoline station/convenience store and contained three gasoline underground storage tanks (USTs) which were reportedly removed in April 1991. The quantity and cause of the reported release (dated November 10, 1992) is unknown.

The majority of the property is paved with concrete or asphalt with some landscaping around the perimeter. The surrounding area includes a mix of commercial and residential properties, with Sonic Drive-In Restaurant located south of the site, a former dry cleaner to the north, and a residence to the east. The site location including local topography is depicted on **Figure 1**. Site and surrounding properties are better illustrated on a site base map provided as **Figure 2**.

#### 1.4 Summary of Previous Environmental Activities

Envirorisk reviewed technical files available electronically for the facility to gain an understanding of the site history. Currently, a total of thirty one (-31-) monitoring wells are included as part of the sampling network (see **Table 2/3**). Well locations are depicted on **Figure 2**. Shallow wells were installed to depths of 13-25 feet below ground surface (ft-bgs) with 10-foot screen sections. Deeper wells (indicated by a “D” at the end of the well ID or a “DMW” designation) were installed to depths of 47-112 ft-bgs with 5-foot screen sections. All wells were installed prior to Envirorisk’s site involvement. Based on a file review, previous corrective action at the site has included multiple extraction events.

Based on the most recent gauging event conducted on November 21-23, 2016 free product was detected as follows: MW-1 (2.01’), MW-5 (0.83’), MW-6 (0.29’), MW-8 (0.29’), MW-9 (1.09’), MW-11 (0.35’), MW-12 (0.33’), MW-17 (0.07’), MW-23 (0.23’), and MW-30 (1.82’). Free product was only detected in the shallow wells. Groundwater samples were most recently collected in November 2016 for analysis of BTEX, naphthalene, MTBE, TAA, and TBA. The highest total concentration reported was 36,250 micrograms per liter (µg/L) in MW-13, located south of the site near Sonic. **Table 2/3** (provided in the Appendix file from SCDHEC) is provided in the appendix and contains the tabulated data for November 2016. Groundwater CoC maps were created by a previous consultant for the November 2016 sampling event and are included as **Figures 4A-4D** for reference.

It is Envirorisk’s understanding that horizontal and vertical delineation of the site has been completed by previous consultants to the satisfaction of SCDHEC. No additional site delineation is proposed in this CAP.

## **2.0 PHYSICAL SETTING**

The physical setting of the site and surrounding region is described in this section. Discussions of regional characteristics were derived from published sources. Site specific characteristics, particularly geological classifications and unit interpolation, were based on a review of readily available file information obtained from SCDHEC.

### **2.1 Topography and Groundwater Flow Direction**

The site elevation is approximately 699' above mean sea level and site groundwater flow, based on a review of previous groundwater flow maps, is to the south/southwest. The closest receptor (according to the 2000 Tier I Assessment Report) is Cox Creek located approximately 700 feet southwest of the site. **Figure 1**, attached, shows site topography. A potentiometric surface map, prepared by a previous consultant using June 2016 data, is included as **Figure 5**.

### **2.2 Regional and Site Geology and Hydrogeology**

The subject site is located in the Piedmont Physiographic province of South Carolina. This province is characterized by rolling hills and stream valleys. In place weathering has chemically altered the bedrock and resulted in the residual soil retaining the structural features of the parent rock material. Bedrock of the area consists of layers of granite gneiss, biotite gneiss, and biotite schist. A review of boring logs in SCDHEC files indicates soils generally consist of clays, clayey silts, sandy silts, and fine to medium sands followed by partially weathered rock (sandy silt/rock fragments/micaceous gneiss bedrock). Geologic cross sections provided in SCDHEC records are included as **Figures 6A-6C**.

Shallow aquifers in the area usually occur in the saprolite unit which is hydraulically connected to the bedrock aquifer. Previous receptor surveys indicated no water supply wells within 1,000 feet of the site. Cox Creek was identified approximately 700 feet southwest and down-gradient of the site. During the November 2016 sampling event, groundwater in the surficial water bearing zone was encountered at depths ranging from approximately 6-14 ft-bgs.

### **2.3 Hydraulic Flow Characteristics**

Hydraulic flow properties including hydraulic conductivity, hydraulic flow, and linear groundwater flow velocity or seepage velocity were evaluated by prior consultants. The hydraulic conductivity can be loosely defined as the velocity at which groundwater moves through the water-bearing soil medium.



The average hydraulic conductivity (K) of the surficial water bearing unit was previously calculated using the MW-2 and MW-3 at  $17.0 \times 10^{-5}$  and  $28.29 \times 10^{-5}$  feet per minute (ft/min), respectively. A seepage velocity of 2.86 feet per year was calculated based on an average K value of  $22.65 \times 10^{-5}$  ft/min (or 0.326 feet per day), a hydraulic gradient of 0.0084 feet per foot (ft/ft), and a porosity of 35% (sandy clay loam). The hydraulic gradient was calculated at 0.055 ft/ft in a July 1, 2014 Groundwater Monitoring Report.

### **3.0 CORRECTIVE ACTION SCOPE AND TECHNOLOGIES**

The corrective action strategy developed for this site includes reduction of free product to <0.01' and reduction of dissolved constituents to the SSTLs as shown on **Table 4**. Prior to selecting a corrective action strategy, several technologies were evaluated based on Envirorisk's experience and a review of reported site conditions, as described in the subsections to follow. Based on the most recent data collected in November 2016, free product is present in ten monitoring wells in thicknesses ranging from 0.07 to 2.01 feet.

#### **3.1 Summary of Remedial Site Conditions**

The treatment area is shown on **Figure 7** and measures approximately 85' by 135' or 11,475 square feet and is located underneath the parking lot and a portion of the adjacent Right-of-Ways (ROWs) for East Greenville Street and McLees Road. The vertical extent, based on historic water table fluctuations, ranges from 6 to 14 ft-bgs in a fine to medium-grained silty-sand/sandy-silt saprolite. Based on a review of November 2016 data, monitoring wells located at or near the up-gradient plume boundary include MW-28, MW-7, and MW-27 to the north-northeast and MW-4, MW-23, and MW-25 to the south-southeast and down-gradient. Free product is present throughout the treatment area. Treatment areas are discussed in further detail in Section 4 and are shown on **Figure 7**.

#### **3.2 Evaluation of Removal Technologies**

Envirorisk evaluated various technologies to remediate the site to the SSTLs. The remedial technologies evaluated included soil vacuum extraction (SVE), air sparging (AS), dual-phase or multi-phase extraction (MPE), surfactant injections/extractions, chemical oxidation, enhanced bioremediation, and soil blending/excavation. Technologies may be combined with one or more methods as part of a full site corrective action strategy. A discussion of each technology is provided in the italicized sections.

##### **3.2.1 *Soil Vacuum Extraction (SVE)***

SVE works by vacuum stripping volatile compounds out of interstitial soil pores through air movement without the use of groundwater extraction. Any volatile compound that exists in the vapor phase under ambient temperatures can theoretically be removed by SVE. Vacuum induced air flow in the vadose zone simply serves to enhance the volatilization process. The success of SVE at a given site is dependent on a number of factors, most notably soil permeability, moisture content, depth to water, fuel type, and contaminant distribution in the vadose zone versus free product presence beneath the water table.

A typical SVE system consists of a 5-10 horsepower (or greater) skid-mounted vacuum blower with a moisture separation tank and suitable high level float controls. Depending on air treatment requirements, influent vapors may need to be treated using thermal or carbon based methods prior to atmospheric discharge. Although this method is generally considered cost effective, it does not effectively address the presence of adsorbed free product trapped below the water table as a result of seasonal fluctuations. For this reason, SVE tends to have the greatest effectiveness in remediating “newer” free product releases in areas where the water table fluctuation has been minimal.

*This technology was not considered in bid preparation and will not likely be utilized for site treatment. However, SVE may be considered for site treatment in combination with another technology such as air sparging described below.*

### **3.2.2 Air Sparging**

Air sparging consists of forcing compressed air below the water table in order to create transient air filled regimes in the saturated zone. Dissolved constituents exposed to the sparged air environment are “stripped” from the dissolved phase into the gas phase where they can be captured as they migrate into the vadose zone with SVE technology. The air sparging process effectively creates a subsurface air stripper where the soil medium acts as the “packing” around which the injected air bubbles migrate through the water column. The sparging process also creates turbulence and increased subsurface mixing between soil and groundwater saturated zones, thereby resulting in the liberation of higher volatile organic compound (VOC) concentrations for SVE removal.

AS/SVE technology is generally effective for treatment of VOCs provided the compound has a Henry’s Constant greater than  $10^{-5}$ . The success of AS/SVE at a given site is dependent on a number of factors most notably hydraulic conductivity, aquifer heterogeneity, soil permeability, depth to groundwater, ground cover, and contaminant distribution in the vadose zone and beneath the water table.

*This technology may be utilized in conjunction with SVE as a follow-up technology.*

### **3.2.3 Multi-Phase Extraction (MPE)**

MPE is a technology that attempts to overcome the limitations of SVE, free product skimming, and standard pump-and-treat technologies through the simultaneous removal of volatile hydrocarbons from the dissolved phase, free product, vapor phase, and adsorbed soil particle phase. The term “multi-phase” extraction refers to the system’s ability to extract free product, impacted groundwater, and soil vapors with specially designed high vacuum blowers capable of handling liquid and vapor streams. This method is similar in application to pump-and-treat but with the advantage of treating contaminated soils above and below the water table.



MPE is commonly applied through the use of vacuum trucks (AFVR) or a stationary system. Both applications involve drawing a high vacuum through PVC drop tubes installed in new or existing monitoring or recovery wells. The vacuum draws the water table down to an equilibrium level while extracting free product and adsorbed hydrocarbon constituents from the exposed soils beneath the water table. As the drop tubes are moved upward or downward, depending on the screened interval of the recovery wells, free product can be progressively removed from various portions of the soil column where impact is present including the vadose zone. The goal of the technology is to remove a minimal amount of groundwater while extracting free product and adsorbed hydrocarbons in the soil vapor. The success of the technology is determined by measuring the concentration of hydrocarbons in the off-gas stream and through measuring the resulting free product thicknesses and petroleum concentrations in the groundwater.

The success of MPE is dependent on soil permeability, moisture content, depth to water, fuel type, and contaminant distribution. A pilot test is generally performed prior to installing a stationary MPE system to determine the extent of groundwater drawdown and vacuum and flow rate needed for optimum recovery. A typical MPE system consists of a high vacuum liquid ring blower with a moisture separation tank and an oil-water separator and air stripper for influent groundwater. Depending on air treatment requirements, influent vapors may need to be treated using thermal desorption or similar method prior to atmospheric discharge.

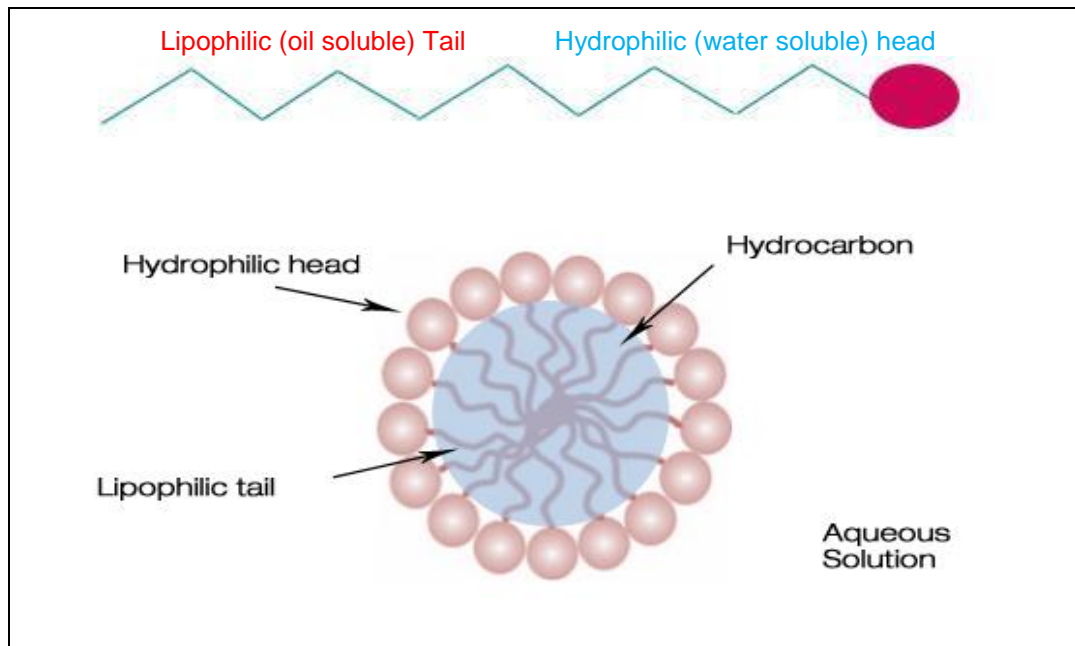
*Mobile MPE will likely be utilized in combination with surfactant applications and in combination with other remedial methods.*

#### **3.2.4 Surfactant Injections/Extractions**

Surfactants can be injected to reduce the surface tension between free product and soil particles where free product is typically “trapped” in interstitial pores. After reducing the surface tension, free product can be removed using simple groundwater extraction or mobile MPE (AFVR). Surfactants are chemical substances that have an affinity to both oil and water. The molecular structure of these compounds generally consists of a “Lipophilic” (oil/fuel soluble) tail and a “Hydrophilic” (water soluble) head as shown on the diagram on the following page.

When agitated, the two phases combine as microscopic oil/fuel droplets become encapsulated with a thin film of surfactant and water. These encapsulated droplets are referred to as micelles and when combined create stable macro-emulsions that break down the interfacial tension between trapped fuel/oil, pore water, and subsurface soil particles allowing more efficient recovery.

*Based on the presence of free product and Envirorisk’s prior successes using this remedial technology, surfactant treatments will be utilized for free product removal.*

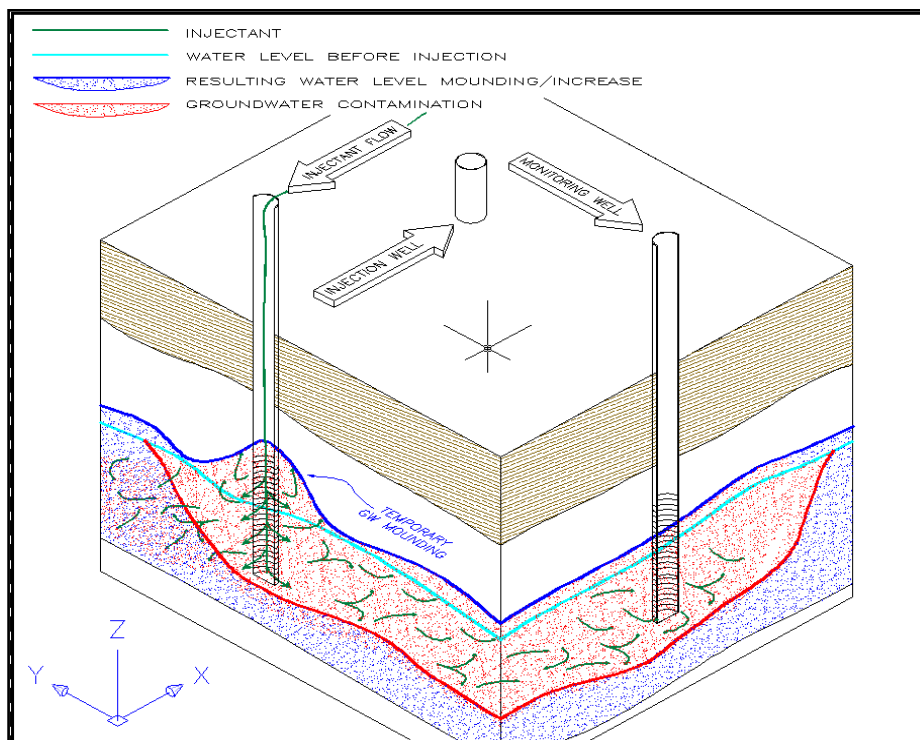


### 3.2.5 Chemical Oxidation

Chemical oxidation methods involve the use of concentrated oxidants to facilitate the chemical breakdown of hydrocarbons in the soil and groundwater. This chemical breakdown occurs as molecular bonds in organic compounds are “cleaved” and oxygen is inserted into the resulting fragments producing end products of carbon dioxide, water, and harmless salts. The oxidation process is generally driven by the creation of aggressive oxidant radicals that react on contact.

Chemical oxidants can be applied either in-situ via injection (ISCO), through in-place soil blending, or ex-situ by removing impacted soils for above ground treatment. Geological and hydrogeological conditions must be considered when developing the application strategy. ISCO field applications have clearly affirmed that matching the oxidant and delivery system to the contaminants of concern and the site conditions is the key to successful implementation.

ISCO field applications generally involve low pressure injection of oxidant fluid at various depths to provide treatment over the entire “smear zone” of contamination both above and below the water table. The addition of oxidant fluid produces a temporary “mounding” of the water table in the vicinity of the injection point. Since ISCO processes occur in the fluid phase, contaminants in the soil matrix must be desorbed from soils before they can react with the oxidant. A conceptual cross-section illustrating contaminant plumes targeted for injection is shown in the diagram below.



The primary drawback to the ISCO technology includes the need for complete oxidant contact with the contaminant which can be hampered by low permeability soils and preferential pathways in the soil matrix. Envirorisk relies on targeted injection techniques utilizing “positive placement monitoring” to overcome this drawback.

Contaminant removal can typically be facilitated at petroleum sites with the use of activated persulfate, catalyzed hydrogen peroxide (CHP), and/or use of solid phase peroxygen compounds including sodium percarbonate and calcium peroxide. Reactions for each are below.

Sodium persulfate oxidation occurs with and without activators including iron salts/chelates, an alkaline substance, induced heat, or hydrogen peroxide. The activation process results in the creation of sulfate radicals which have similar oxidant strength to hydroxyl radicals. The stylized oxidation reaction is as follows:



CHP oxidation involves the combination of hydrogen peroxide, an iron catalyst, and a chelating agent resulting in the creation of hydroxyl radicals with a high oxidation potential.

The basic chemical reaction for CHP/Modified Fenton’s oxidation is as follows:





Modified Fenton's oxidation can also be produced using sodium percarbonate ( $\text{Na}_2\text{CO}_3 \cdot 1.5\text{H}_2\text{O}_2$ ). Sodium percarbonate is a soluble powder that releases hydrogen peroxide under mildly alkaline conditions ( $\text{pH} < 9$ ). The hydrogen peroxide generated can then be catalyzed with iron to produce hydroxyl radicals similar to a Modified Fenton's or CHP oxidant reaction. The chemical formula in solid phase and aqueous state for sodium percarbonate is shown below:

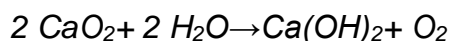


The hydrogen peroxide released will be react with either left over iron from previous ISCO treatments or supplemental iron added, resulting in Modified Fenton's oxidation:

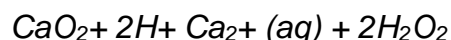


The primary advantage of using sodium percarbonate to generate a CHP or Modified Fenton's reaction is to control the release of hydrogen peroxide and thereby extend the release of hydroxyl radicals. The oxidant reaction is non-corrosive and less exothermic than liquid based CHP applications. Following chemical oxidation, a release of dissolved oxygen will also occur to stimulate long term aerobic bioremediation.

Similar to sodium percarbonate, calcium peroxide can be utilized to generate a modified Fenton's reaction followed by aerobic bioremediation stimulated by a slow release of dissolved oxygen. Calcium peroxide has a low solubility and tends to form calcium hydroxide  $[\text{Ca}(\text{OH})_2]$  at pH values of 11-12 as shown below:



When the pH drops below 10 or 11, some hydrogen peroxide will be formed as shown in the reaction below:



Some or all of the hydrogen peroxide released will be used in a Modified Fenton's reaction as shown above with sodium percarbonate. Dissolved oxygen remaining after ISCO or from the dissolution of calcium peroxide under a higher pH will be subsequently utilized for aerobic bioremediation.

*Based on site conditions and Envirorisk's prior success using ISCO for treatment of dissolved phase constituents, ISCO injections will be utilized for dissolved phase treatment.*

### **3.2.6 Enhanced Bioremediation**

Enhanced bioremediation is a process that attempts to accelerate the natural biodegradation processes already at work in the subsurface environment from microbial organisms. Enhancement is usually accomplished by providing nutrients, electron donors, or competent degrading microorganisms. The most common methods of enhanced bioremediation involve stimulating the subsurface by injecting nutrients to encourage either natural aerobic or anaerobic microbial activity. This is commonly referred to as in-situ bioremediation, or ISB.

Oxygen enhancement, commonly used to stimulate aerobic activity for degradation of petroleum hydrocarbons, can be achieved by either air sparging below the water table (bio-sparging including proprietary methods such as PHOSter™) or circulating low level oxygen enhancers throughout the contaminated ground water zone. Oxygen enhancement using bio-sparging is typically used in conjunction with SVE or bio-venting to enhance removal of volatiles. Additionally, solid-phase peroxide products or other slow release oxygenators can also be injected (ISB) into the subsurface to stimulate more rapid aerobic biodegradation.

Conditions influencing natural biodegradation need to be fully understood prior to enhancing natural processes. This is commonly performed by evaluating geochemical parameters in the groundwater along with relative concentrations of natural inorganics that may be utilized as electron acceptors and donors. Bench scale microbial studies may also be performed to better evaluate degradation rates.

Based on the contaminants present at this site (petroleum products), aerobic and/or anaerobic stimulation may be effective. Aerobic biostimulation will involve the use of oxygen release compounds in a “treatment train” approach. This can be accomplished using CHP, calcium peroxide, or sodium percarbonate oxidants that release oxygen during and following chemical oxidation. Anaerobic treatment would involve stimulating nitrate, iron, and/or sulfate-reducing bacteria in a reducing environment which may involve the injection of an organic carbon source to facilitate. Common organic substrates include sodium lactate or similar food grade products. Anaerobic treatment will be considered if sodium persulfate oxidation is utilized in order to take advantage of the residual sulfate remaining after the ISCO treatment.

*Enhanced bioremediation, including ISB and bio-sparging technologies, may be utilized in combination with or following ISCO for site treatment of low to moderate dissolved phase constituents.*

### **3.2.7 Soil Excavation/Soil Blending/Off-site Landfilling**

In some cases, aggressive soil removal above and below the water table can be utilized as an effective means of removing impacted soils and blending in oxidants and/or bioremediation amendments. This process is often coupled with limited groundwater extraction to remove high dissolved phase constituents/free product recharging on the groundwater surface during excavating. Conventional excavation equipment has a maximum reach of 20 ft-bgs.

One alternative to conventional excavation is the advancement of a series of closely spaced large diameter borings using a “bucket” auger rig. This drill rig is similar to a caisson rig and is typically utilized in the installation of bored water wells. This drill method allows the removal of impacted soils with each advancement of the auger. Contaminated soils removed with the bucket attachment can be placed in roll-offs or dump trucks for off-site disposal at a Subtitle D landfill. In addition, impacted soils may be treated in-situ by blending in liquid and solid phase amendments to facilitate both ISCO processes in the groundwater and enhanced bioremediation. Temporary injection and/or extraction wells may also be installed in the open boreholes to further facilitate remediation.

*Bucket auger rigs may be utilized in combination with ISCO treatment in the event that adequate contact and treatment is not achieved with ISCO and ISB.*

## **4.0 PROPOSED PLAN FOR REMEDIATION**

Based on the initial assessment of site conditions, free product and dissolved CoC reduction will be accomplished through a combination of surfactant injections/extractions and ISCO applications as outlined in the sections below. The primary injection technologies will be supplemented, if needed, with alternative technologies as described in Section 3. The treatment plan described below is shown on **Figure 7**. Per the Solicitation, physical access on the Sonic Restaurant is not included due to access issues. Therefore, SCDHEC has requested the use of angle-drilling beneath McLees Road ROW.

### **4.1 Drilling & Injection/Extraction Well Installation**

To facilitate effective surfactant and ISCO product delivery, Envirorisk will advance a maximum of 25, two-inch diameter injection/extraction wells and a maximum of 55 temporary direct push injection points. The injection/extraction (IW/EWs) wells will be installed to depths of approximately 13 to 15 ft-bgs with 5-10 foot screens. Soil logging and field screening will be performed on a limited number of the IW/EWs to determine screen placement. The wells will be installed by a SC Licensed driller using either large diameter 3.25-inch inner diameter direct push rods or 2.25 to 3.25 inner diameter hollow stem augers. All wells will be constructed using Schedule 40 PVC with silica sand packs, hydrated bentonite seals, and secondary grout seals. The top of the PVC casings will be secured with a camlock fitting and threaded PVC cap to facilitate injection/extraction followed by a locking manhole cover enclosed in a concrete pad.

Following IW/EW installation and subsequent treatment, up to 55 direct push temporary injection points will be advanced for ISCO treatment. Depending on site conditions, some or all of these temporary injection points may be converted into one-inch diameter injection wells. The exact number of injection points/wells and locations will be based on field conditions, primarily including injectant flow and movement in the subsurface. Proposed IW/EW and direct push locations are displayed on **Figure 7**.

### **4.2 Surfactant Treatment/Extractions**

A 12 to 24-hour mobile MPE/AFVR event will be initially performed using some or all of the newly installed injection/extraction wells. Extraction will be performed using one-inch drop tubes or “stingers” lowered to various depths below the water table in the contaminant “smear zone”. The purpose of this initial mobile AFVR is to determine the quantity of fluid recovered from each IW/EW and/or group of wells for use in calculating surfactant dosing. In general, Envirorisk calculates surfactant doses assuming subsequent extraction removal of 1 to 1.5 times the liquid injected.

In a follow-up field mobilization, surfactant injection will be performed by injecting 200 to 500 gallons of a 2% to 5% solution into selected IW/EWs under mild pressure. After allowing sufficient time for free product emulsification and partial solubilization, one or more additional mobile AFVR events will be conducted to recover the emulsified free product and petroleum impacted groundwater. Waste manifests will be provided

following extraction events. Based on free product recharge and field conditions encountered, additional injection(s) and extraction(s) will be conducted to remove all or most of the free product.

During injection and extraction, Envirorisk will conduct field monitoring including depth to water and free product thickness gauging and geochemical parameter monitoring [pH, conductivity, temperature, dissolved oxygen (DO), and oxidation-reduction potential (ORP)], as needed. The degree of emulsification will also be evaluated through physical inspection of bailed free product and groundwater collected during treatment.

### 4.3 Angle-Drilled Wells

The Solicitation states that following free product removal, angle-drilled wells should be utilized for dissolved site treatment beneath McLees Road ROW. This requirement was presumably due to access restrictions associated with the Sonic Restaurant. A total of six or seven angled wells will be installed on the southeast portion of the treatment area as shown on **Figure 7**. Wells will be installed using 1" or 2" Schedule 40 PVC at an approximate 45-degree angle using a direct push rig or small auger rig. Screen sections will penetrate the subsurface within the impacted zone and will terminate in the midline of the road. Due to the angled installation, a silica sand pack will not be installed; however, a 2' prepack bentonite seal will be flush-threaded on top of the screen to prevent secondary grout intrusion. After grouting, wells will be completed with flush mounted well vaults. Wells will be utilized for ISCO treatment and/or mobile AFVR as described.

### 4.4 ISCO/Enhanced Bioremediation

Contaminant removal can typically be facilitated at petroleum sites with the use of activated persulfate, catalyzed hydrogen peroxide (CHP), and/or use of solid phase peroxygen compounds including sodium percarbonate and calcium peroxide. ISCO injections will be performed using up to 55 temporary injection points as well as up to 25 IW/EWs depicted on **Figure 7**. (The number of injection points/wells may be increased or decreased based on the effectiveness of the treatment). Based on experience with similar sites, the oxidant blend injected will likely consist of an initial treatment using CHP/Modified Fenton's (hydrogen peroxide and/or sodium percarbonate, calcium peroxide with an iron chelator) to reduce high dissolved VOCs and reduce/remove any remaining interstitial free product pockets. Following Modified Fenton's oxidation, un-activated or activated sodium persulfate will likely be injected to provide more long-term oxidant treatment. It is expected that two or more treatments will be required. Additional mobile AFVR events will also be performed, as needed, to supplement the ISCO treatments. The **UIC Permit** is included as an attachment.

Injection will be performed under low to moderate pressure using Envirorisk's mobile injection vehicle. During and immediately following ISCO injection, geochemical parameters (pH, conductivity, temperature, DO, and ORP) as well as depth to water and free product (if detected) thickness will be collected, as needed, to assess the radial extent of oxidant treatment.



Bioremediation (ISB) may be performed using solid or liquid phase amendments in conjunction with or following ISCO treatments. Amendments will be injected either with oxidants (i.e. same injection) or following. Alternatively, supplemental treatment may be performed using AS/SVE or bio-sparging (PHOSter) to reach lower dissolved constituent treatment goals. PHOSter is an air sparging technology in which triethyl-phosphate (TEP) is added through injections in the air stream to stimulate oxygen required to develop or sustain aerobic conditions. Implementation of these technologies may necessitate the need for additional air delivery injection wells as well as subsurface delivery piping. These systems are in-situ based and would NOT require off-site fluid discharges.

#### **4.5 Semi-Annual Groundwater Sampling**

As outlined in the Solicitation, all wells will be sampled semi-annually. If free product is detected the well will not be sampled. Wells will be sampled for the following constituents: BTEX, naphthalene, MTBE, TAA, and TBA using Method 8260. Sampling procedures will be followed as outlined in the “Quality Assurance Program Plan for the Underground Storage Tank Management Program, Revision 3.1” dated February 2016 and Envirorisk’s Annual Contractor Quality Assurance Plan (ACQAP). As specified in the Solicitation, once free product has been removed, gauging will be conducted by SCDHEC. In addition, once sampling data indicates a 100% CoC concentration reduction, the Agency will be notified and corrective action activities will cease. The wells will be sampled for two quarters during the verification period. Split sampling will be performed with SCDHEC during the second verification event.

During the verification period, wells will be gauged and sampled quarterly. If the 100% CoC reduction goal has not been maintained, corrective action as described above will resume. Appropriate reports will be submitted following each gauging and/or sampling event.

#### **4.6 Timeline**

The table below lists predicted completion dates for the project. Dates are approximate, and are subject to change based on SCDHEC’s input and response time to submittals, possible public notice delays, weather delays, holidays, changes in site conditions, and other conditions out of Envirorisk’s control. The table is split into two sections, the first containing completed tasks and the second containing upcoming tasks.

**Table 5. Timeline**

<b>COMPLETED TASKS</b>		
<b>Task</b>	<b>Submittal</b>	<b>Date</b>
Site Specific Work Plan for Initial Monitoring Event	Site Specific Work Plan	August 1, 2017
CAP Preparation / UIC Permit Application / Work Plan	CAP ( <i>this submittal</i> )	September 7, 2017
<b>UPCOMING TASKS</b>		
<b>Task</b>	<b>Submittal</b>	<b>Date</b>
SCDHEC review of CAP/ Public Notice	Notice to Proceed ( <i>from DHEC</i> )	Assume 60 days- November, 2017
Initial Monitoring Event	Initial Monitoring Report	Due September 17, 2017
CAP Implementation	CAP Implementation Report	Field: 30 days from Notice to Proceed- December 2017 Report: 60 days from Notice to Proceed- January 2018 <b>Invoice 40% of contract</b>
Corrective Action / Semi-Annual Sampling	Appropriate Corrective Action System Evaluation (CASE) Report	Semi-annually with first report due within 90 days of CAP Implementation Report
Invoicing	CASE Reports	<b>Invoice will be submitted with CASE reports for 10% of contract for reduction of free product to &lt;0.01'</b>
Invoicing	CASE Reports	<b>Invoices will be submitted with CASE report for 10% of contract for CoC reduction of 60%</b>
Invoicing	CASE Reports	<b>Invoices will be submitted with CASE reports for 5% of contract for CoC reductions of 90% and 100%</b>
Update QAPP Contractor Addendum	QAPP	First quarter of each year
Abandon and/or Remove Assessment and Corrective Action Equipment Components	Appropriate CASE Report	Within 60 days from notice by the Agency <b>Invoice 30% of contract</b>

A Contractor's Checklist is provided as **Appendix K**. The **Site Specific Work Plan** is also included as an attachment.



**Site-Specific Work Plan for Approved ACQAP  
Underground Storage Tank Management Division**

To: \_\_\_\_\_ (SCDHEC Project Manager)  
From: \_\_\_\_\_ (Contractor Project Manager)  
Contractor: \_\_\_\_\_ UST Contractor Certification Number: \_\_\_\_\_

Facility Name: \_\_\_\_\_ UST Permit #: \_\_\_\_\_  
Facility Address: \_\_\_\_\_  
Responsible Party: \_\_\_\_\_ Phone: \_\_\_\_\_  
RP Address: \_\_\_\_\_  
Property Owner (if different): \_\_\_\_\_  
Property Owner Address: \_\_\_\_\_  
Current Use of Property: \_\_\_\_\_

**Scope of Work** (Please check all that apply)

☐ IGWA                      ☐ Tier II                      ☐ Groundwater Sampling                      ☐ GAC  
☐ Tier I                      ☐ Monitoring Well Installation                      ☐ Other \_\_\_\_\_

**Analyses** (Please check all that apply)

Groundwater/Surface Water:

<input type="checkbox"/> BTEXNMDCA (8260B)	<input type="checkbox"/> Lead	<input type="checkbox"/> BOD	<input type="checkbox"/> Methane
<input type="checkbox"/> Oxygenates (8260B)	<input type="checkbox"/> 8 RCRA Metals	<input type="checkbox"/> Nitrate	<input type="checkbox"/> Ethanol
<input type="checkbox"/> EDB (8011)	<input type="checkbox"/> TPH	<input type="checkbox"/> Sulfate	<input type="checkbox"/> Dissolved Iron
<input type="checkbox"/> PAH (8270D)	<input type="checkbox"/> pH	<input type="checkbox"/> Other _____	

Drinking Water Supply Wells:

<input type="checkbox"/> BTEXNMDCA (524.2)	<input type="checkbox"/> Mercury (200.8 245.1 or 245.2)	<input type="checkbox"/> EDB (504.1)
<input type="checkbox"/> Oxygenates & Ethanol (8260B)	<input type="checkbox"/> RCRA Metals (200.8)	

Soil:

<input type="checkbox"/> BTEXNM	<input type="checkbox"/> Lead	<input type="checkbox"/> RCRA Metals	<input type="checkbox"/> TPH-DRO (3550B/8015B)	<input type="checkbox"/> Grain Size
<input type="checkbox"/> PAH	<input type="checkbox"/> Oil & Grease (9071)	<input type="checkbox"/> TPH-GRO (5030B/8015B)	<input type="checkbox"/> TOC	

Air:

☐ BTEXN

**Sample Collection** (Estimate the number of samples of each matrix that are expected to be collected.)

_____ Soil	_____ Water Supply Wells	_____ Air	_____ Field Blank
_____ Monitoring Wells	_____ Surface Water	_____ Duplicate	_____ Trip Blank

**Field Screening Methodology**

Estimate number and total completed depth for each point, and include their proposed locations on the attached map.

# of shallow points proposed: \_\_\_\_\_ Estimated Footage: \_\_\_\_\_ feet per point

# of deep points proposed: \_\_\_\_\_ Estimated Footage: \_\_\_\_\_ feet per point

Field Screening Methodology: \_\_\_\_\_

**Permanent Monitoring Wells**

Estimate number and total completed depth for each well, and include their proposed locations on the attached map.

# of shallow wells: \_\_\_\_\_ Estimated Footage: \_\_\_\_\_ feet per point

# of deep wells: \_\_\_\_\_ Estimated Footage: \_\_\_\_\_ feet per point

# of recovery wells: \_\_\_\_\_ Estimated Footage: \_\_\_\_\_ feet per point

Comments, if warranted:

\_\_\_\_\_  
\_\_\_\_\_

UST Permit #: _____ Facility Name: _____	
<b>Implementation Schedule</b> (Number of calendar days from approval) Field Work Start-Up: _____ Field Work Completion: _____ Report Submittal: _____ # of Copies Provided to Property Owners: _____	
<b>Aquifer Characterization</b> Pump Test: <input type="checkbox"/> Slug Test: <input type="checkbox"/> (Check one and provide explanation below for choice) _____ _____ _____	
<b>Investigation Derived Waste Disposal</b> Soil: _____ Tons Purge Water: _____ Gallons Drilling Fluids: _____ Gallons Free-Phase Product: _____ Gallons	
<b>Additional Details For This Scope of Work</b> For example, list wells to be sampled, wells to be abandoned/repared, well pads/bolts/caps to replace, details of AFVR event, etc. _____ _____ _____ _____ _____ _____ _____	
<b>Compliance With Annual Contractor Quality Assurance Plan (ACQAP)</b> ____ Laboratory as indicated in ACQAP? (Yes/No) If no, indicate laboratory information below. Name of Laboratory: _____ SCDHEC Certification Number: _____ Name of Laboratory Director: _____  ____ Well Driller as indicated in ACQAP? (Yes/No) If no, indicate driller information below. Name of Well Driller: _____ SCLLR Certification Number: _____  ____ Other variations from ACQAP. Please describe below. _____ _____ _____ _____ _____	
<b>Attachments</b> 1. Attach a copy of the relevant portion of the USGS topographic map showing the site location.  2. Prepare a site base map. This map must be accurately scaled, but does not need to be surveyed. The map must include the following: North Arrow Proposed monitoring well locations Location of property lines Legend with facility name and address, UST permit number, and bar scale Location of buildings Streets or highways (indicate names and numbers) Previous soil sampling locations Location of all present and former ASTs and USTs Previous monitoring well locations Location of all potential receptors Proposed soil boring locations  3. Assessment Component Cost Agreement, SCDHEC Form D-3664	

Former 81 Food Mart, UST Permit #12458

[illegible]



Table 2/3. Potentiometric and Laboratory Data  
Former 81 Food Mart, UST Permit #12458

Monitoring Well	TOC	GW Depth (ft)	GW Elevation (ft)	FP (ft)	B	T	E	X	Naphth	MTBE	TAA	TBA
MW-15 screen 15-25' Nov 21-23, 2016	NA	12.35	NA		<5	<5	<5	<5	<5	<5	<100	<100
MW-16 screen 10-20' Nov 21-23, 2016	NA	11.10	NA		<5	<5	<5	<5	<5	<5	<100	<100
MW-17 screen 10-20' Nov 21-23, 2016	NA	11.01	NA	0.07								
MW-18D screen 75-80' Nov 21-23, 2016	NA	11.36	NA		<5	<5	<5	<5	<5	<5	<100	<100
MW-19D screen 43-48' Nov 21-23, 2016	NA	13.00	NA		<5	<5	<5	<5	<5	<5	<100	<100
MW-20D screen 42-47' Nov 21-23, 2016	NA	11.74	NA		<5	<5	<5	<5	<5	<5	<100	<100
MW-21D screen 42-47' Nov 21-23, 2016	NA	10.14	NA		<5	<5	<5	<5	<5	<5	<100	<100
MW-22D screen 42-47' Nov 21-23, 2016	NA	9.25	NA		<5	<5	<5	<5	<5	<5	<100	<100
MW-23 screen 8-18' Nov 21-23, 2016	90.79	6.01	84.61	0.23								
MW-24 screen 10-20' Nov 21-23, 2016	91.49	9.88	81.61		900	80	120	360	52	810	2800	630
MW-25 screen 10-20' Nov 21-23, 2016	NA	12.65	NA		66	10	<5	91	25	<5	<100	<100

**Table 2/3. Potentiometric and Laboratory Data  
Former 81 Food Mart, UST Permit #12458**

<b>Monitoring Well</b>	<b>TOC</b>	<b>GW Depth (ft)</b>	<b>GW Elevation (ft)</b>	<b>FP (ft)</b>	<b>B</b>	<b>T</b>	<b>E</b>	<b>X</b>	<b>Naphth</b>	<b>MTBE</b>	<b>TAA</b>	<b>TBA</b>
MW-26 screen 10-20' Nov 21-23, 2016	NA	9.30	NA		<5	<5	<5	<5	<5	<5	<100	<100
MW-27 screen 11-21' Nov 21-23, 2016	NA	11.75	NA		1700	1500	200	1100	100	42	240	<400
MW-28 screen 10-20' Nov 21-23, 2016	NA	11.12	NA		<5	<5	<5	<5	<5	<5	<100	<100
MW-30 screen 10-20' Nov 21-23, 2016	NA	10.01	NA	1.82								
DMW-1 screen 73-78' Nov 21-23, 2016	94.71	4.54	90.17		<5	<5	<5	<5	<5	<5	<100	<100
DMW-2 screen 75-80' Nov 21-23, 2016	NA	9.52	NA		<5	29	<5	<5	<5	<5	<100	<100
DMW-3 screen 107-112' Nov 21-23, 2016	NA	13.36	NA		<5	<5	<5	<5	<5	<5	<100	<100
KMO-17 screen 5-15' Nov 21-23, 2016	87.79	9.43	78.36		<5	<5	23	14	13	<5	<100	<100
KMO-18 screen 5-15' Nov 21-23, 2016	85.93	7.69	78.24		<5	<5	<5	<5	<5	<5	<100	<100

**Notes:**

All analytical results are in micrograms per liter (µg/L).

November 2016 data was collected by a previous consultant and was obtained from the Appendix file.

Groundwater elevations for wells containing FP are calculated as follows: TOC - [DTW + (FP thickness x 0.75)]

Screened intervals and TOC taken from SC DHEC appendix files.

NA = not applicable, TOC not provided

NS = not sampled

J = estimated value

ft = feet below ground surface

Table 4. Site specific Target Levels

81 Food Mart, UST Permit #12458

Site-Specific Target Levels (SSTLs) in parts per billion (ppb)

Well	Benzene	Toluene	Ethylbenzene	Xylenes	Naph.	MTBE	TAA	TBA
MW-1	40	26540***	3700***	21680***	285	1681	10086	58835
MW-4	5**	5**	5**	5**	5**	5**	100**	100**
MW-5	47	26540***	3700***	21680***	352	2339	14034	81865
MW-6	52	26540***	3700***	21680***	391	2757	16542	96495
MW-7	5**	5**	5**	5**	5**	5**	100**	100**
MW-8	52	26540***	3700***	21680***	391	2757	16542	96495
MW-9	27	26540***	3700***	21680***	185	862	5172	30170
MW-11	43	26540***	3700***	21680***	317	1984	11904	69440
MW-12	30	26540***	3700***	21680***	206	1020	6120	35700
MW-14	5**	5**	5**	5**	5**	5**	100**	100**
MW-15	5**	5**	5**	5**	5**	5**	100**	100**
MW-16	5**	5**	5**	5**	5**	5**	100**	100**
MW-17	62	26540***	3700***	21680***	481	3825	22950	133875
MW-18D	5**	5**	5**	5**	5**	5**	100**	100**
MW-19D	5**	5**	5**	5**	5**	5**	100**	100**
MW-20D	5**	5**	5**	5**	5**	5**	100**	100**
MW-21D	5**	5**	5**	5**	5**	5**	100**	100**
MW-22D	5**	5**	5**	5**	5**	5**	100**	100**
MW-23	19	12928	3700***	21680***	119	437	2622	15295
MW-24	23	80*	120*	360*	52*	437	2622	630*
MW-25	52	10*	5**	91*	25*	5**	100**	100**
MW-26	5**	5**	5**	5**	5**	5**	100**	100**
MW-27	25	1500*	200*	1100*	100*	42*	240*	400**
MW-28	5**	5**	5**	5**	5**	5**	100**	100**
MW-30	19	12,928	3700***	21680***	119	437	2622	15295
DMW-1	5**	5**	5**	5**	5**	5**	100**	100**
DMW-2	5**	29*	5**	5**	5**	5**	100**	100**
DMW-3	5**	5**	5**	5**	5**	5**	100**	100**


\* Lab analysis is less than calculated SSTLs, therefore SSTL mass is set equal to laboratory mass

\*\* Lab analysis is below detection limits, therefore SSTL mass is set equal to detection limits

\*\*\* SSTL is set to effective solubility limit

**Physical corrective action on the Sonic Restaurant property is not included in this solicitation due to access issues. See Performance Requirement #2 for more details.**

Source: SCDHEC Appendix file

Form  I  UIC	<div>D H F C</div> <div>Underground Injection Control Permit Application Ground-Water Protection Division (Collected under the Authority of Title 48 Chapter I of the 1976 South Carolina Code of Laws)</div>		I. EPA ID NUMBER									
						T/A	C					
			U									
Read attached instructions before starting. For Official Use Only												
Application Approved month day year			Date Received month day year			Permit Well Number						
Comments												
II. Facility Name and Address					III. Owner/Operator and Address							
Facility Name 81 Food Mart					Owner/Operator Name Envirorisk Consultants, Inc.							
Street Address 1502 E. Greenville Street					Street Address PO Box 945							
City			State		Zip Code		City		State		Zip Code	
Anderson			South Carolina		29621		Grayson		Georgia		30017	
IV. Ownership Status (Select One)					V. SIC Codes							
<input type="checkbox"/> A. Federal <input type="checkbox"/> B. State <input checked="" type="checkbox"/> C. Private					7549							
<input type="checkbox"/> D. Public <input type="checkbox"/> E. Other (Explain) <input type="text"/>												
VI. Well Status (Select A, B or C)												
<input type="checkbox"/> A. Operating		Date Started (MM/DD/YYYY)				<input type="checkbox"/> B. Modification/Conversion		<input checked="" type="checkbox"/> C. Proposed				
VII. Type of Permit Requested - Class and Type of Well (see reverse)												
A. Class(es) enter code(s) VA		B. Type(s) enter code(s) I		C. If class is "other" or type is code 'Y', explain N/A			D. Number of Wells per type 25 IWs,55 points,7 angle wells					
VIII. Location of Wells or Approximate Center of field or Project												
C	A. Latitude						B. Longitude					
I	Deg 34	Min 31	Sec 38.424			Deg -82	Min 38	Sec 8.7714				
IX. Attachments												
Complete the following questions on a separate sheet(s) and number accordingly; see instructions for Classes II, III, and V, complete and submit on a separate sheet(s) attachments A-U as appropriate. Attach maps where required. List attachments by letter which are applicable and include with your application.												
X. Certification												
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment.												
A. Name (Type or Print)			Title			B. Phone No.						
Kenneth Summerour			Principal Geologist			(678) 635-7360						
C. Signature						D. Date Signed (MM/DD/YYYY)						
						09/07/2017						



**Instructions for Attachments to Form 1  
Underground Injection Control  
for Corrective Action Wells  
(effective 01/91)**

**Attachment A: Activity for Review**

Submit a brief description of the activities to be conducted that require a UIC permit.

*Activities include drilling/installation of injection/extraction wells and surfactant injection(s) followed by extraction(s) and ISCO injection(s). Oxidants/chemicals/activators/bio-amendments utilized may include the following:*

- sodium percarbonate;
- sodium persulfate;
- calcium peroxide;
- hydrogen peroxide; and
- sodium alpha olefin sulfonate.

*MSDS forms are attached.*

**Attachment B: Well Construction Details**

Submit schematics or other appropriate drawings of the surface and subsurface construction details of the recovery and injection wells.

*Chemical will be applied via a maximum of 55 direct push injection points and/or a maximum of 25 temporary injection/extraction wells. In addition, up to 7 angled wells will be installed beneath McLees Road (per SCDHEC instructions in the Solicitation). Proposed locations are shown on Figure 7 and well schematics are attached.*

**Attachment C: Operating Data**

Submit the following proposed operating data for each injection well:

1) Average and maximum daily rate and volume of fluid to be injected. In addition, indicate the average and maximum daily rate and volume of fluid to be withdrawn from each recovery well. Verification of the aquifer's hydraulic ability to product and accept the quantities proposed should be presented.

*Injection quantities will vary from 100-500 gallons per injection well/point based on aquifer permeability. Typically, 2,000-3,000 gallons a day will be injected.*

2) Average and maximum injection pressure.

*10-50 psi.*

3) Pumping schedule (i.e. continuous, alternating cycles, etc.)

N/A



4) Proposed ranges in the concentration of all contaminant constituents within the injection fluid. Include comprehensive ground-water quality data from a "worst case" well sample.

*Based on the most recent gauging event conducted on November 21-23, 2016 free product was detected as follows: MW-1 (2.01'), MW-5 (0.83'), MW-6 (0.29'), MW-8 (0.29'), MW-9 (1.09'), MW-11 (0.35'), MW-12 (0.33'), MW-17 (0.07'), MW-23 (0.23'), and MW-30 (1.82'). The highest total concentration reported was 36,250 micrograms per liter (µg/L) in MW-13, located off-site to the south. Site data is included on Table 2/3 in the CAP.*

5) Length of time the project is expected to require injection to complete remediation (to ensure the effective dates of the permit will allow sufficient time to complete the project).

*Approximately 2-5 years.*

#### **Attachment D: Monitoring Program**

Discuss the planned monitoring program in detail:

1) Include a discussion of monitoring devices, sampling frequency (sufficient to verify treatment system efficiency), sampling protocol, sampling location, parameters to be analyzed, and proposed method(s) of analysis.

*Wells will be sampled semi-annually. Wells containing free product will not be sampled. In addition, geochemical parameters (pH, conductivity, temperature, DO, and ORP) will be evaluated during injection activities.*

2) This plan should indicate how, through monitoring, the proposed contaminant levels in the injectate will be verified.

*Geochemical parameters will be collected during injection activities, and semi-annual groundwater sampling of all for analysis of BTEX, naphthalene, MTBE, TAA, and TBA.*

3) This plan should also clearly illustrate exactly how hydraulic control of the contaminant plume (and injectate, where relevant) will be verified through monitoring (i.e., piezometers, quality analyses, etc.).

*Perimeter wells will be sampled semi-annually to evaluate possible plume migration.*

#### **Attachment E: Existing of Pending State/Federal Permits**

List the program and permit number of any existing State of Federal permits for the facility (i.e., NPDES, RCRA, UST, etc.).

*UST Permit #12458*

#### **Attachment F: Description of Business**

Give a brief description of the nature of the business of the facility and any immediately adjacent facilities.

UST #12458 is currently operating as Labtech Diagnostics, a medical diagnostics laboratory. The surrounding area includes a mix of commercial and residential properties, with Sonic Drive-In Restaurant located south of the site, a former dry cleaner to the north, and a residence to the east.

**Attachment G: Area of Review**

1) The area of review should be a fixed radius of ¼ mile from the injection well, the outermost injection wells (if a wellfield).

*Your comment is noted.*

2) If a fixed radius is not selected, the methods and the calculations used to determine the size of the area of review should be submitted.

N/A

**Attachment H: Maps of Wells and Area of Review**

1) Submit a topographic map of the area, extending one mile beyond the project boundaries. This map should show all hazardous waste treatment, storage, or disposal facilities, and all intake and discharge structures associated with the project facility. Any known areas of soil and/or ground-water contamination within a one mile radius should be indicated. Also indicate all surface water bodies of water, springs, mines (surface or subsurface), quarries, and other pertinent surface features such as residences, roads, and geologic faults (known or suspected).

*Please refer to Figure 1. Site groundwater flow, based on a review of previous groundwater flow maps, is to the south/southwest. The nearest potential receptor is Cox Creek, located approximately 700' southwest of the site. No water supply wells were identified within 1,000 feet.*

2) A scaled maps(s) should be included which shows the name and/or number and the location of ALL production, injection, monitoring, abandoned and dry wells within the area of review. This should be accomplished by file and field surveys. Information regarding the construction (i.e., total depth, diameter, casing/screened intervals, grouting, etc.) and the current status (i.e., actively used, temporarily abandoned, permanently abandoned) of ALL wells within the area of review should be submitted. If any wells have been abandoned, details on the method the wells were abandoned (i.e., cemented/grouted, filled with sand, etc.) should be included.

*Please refer to Figure 2. A total of 31 monitoring wells are currently part of the sampling network at the site. Shallow well depths range from 13-25 feet with 10-foot screen sections and deeper well depths range from 47-112 feet with 5-foot screen sections. Additional construction details are available in SC DHEC files. Wells were installed prior to Envirorisk's involvement.*

3) A potentiometric map of the project site should be submitted which accurately locates all monitoring wells and proposed recovery and injection wells and outlines the horizontal extent of both the free-phase contamination (where applicable) and dissolved contaminant plumes. Include all water level and product thickness data. The data and time that water levels and product thicknesses were measured should be indicated.

*This map has not been prepared by Envirorisk for the CAP. However, a potentiometric map (Figure 5- June 2016 data) and plume maps (Figures 4A-4D- November 2016 data) were prepared by previous consultants and are attached. The most recent groundwater gauging and sampling event was conducted in November 2016.*

**Attachment I: Cross Sections/Diagrams**

1) Geologic cross sections indicating the lithology and stratigraphy of the site and the horizontal and vertical extent of the contaminant plume, should be submitted. At least two stratigraphic cross sections, one parallel and one perpendicular to the horizontal ground-water flow direction, should be submitted.

*This map has not been prepared by Envirorisk for the CAP. Previous cross sections prepared by other consultants are attached as Figures 6A-6C.*

2) A schematic diagram, in the form of a cross section, showing the proposed remediation system with the components of flow (above and below ground) and all associated appurtenances (i.e., stripping tower, piping, wells, etc.).

N/A

**Attachment J: Name and Depth of Underground Sources of Drinking Water (USDW's)**

Identify and describe all aquifers which may be affected by the injection.

*Envirorisk does not have detailed aquifer information; however, only groundwater in the immediate vicinity of the injection wells/points should be affected.*

**Attachment K: Hydraulic Control**

1) Sufficient supporting data (i.e. time/drawdown data, Theis curves and methods, calculations, etc.), used to determine aquifer characteristics to verify complete hydraulic control over the contaminant plume (and injectate, if proposed injectate quality does not conform to classified ground-water standards) during injection should be submitted. At a minimum, values should be given for transmissivity, hydraulic conductivity, effective porosity and specific yield

*Injection will not exceed pore volumes in the contaminated water zone. Injection will be performed from the perimeter into the heart of the plume to limit potential migration. The average hydraulic conductivity of the surficial water bearing unit (calculated by previous consultants) for MW-2 and MW-3 was calculated at  $17.0 \times 10^{-5}$  and  $28.29 \times 10^{-5}$  feet per minute (ft/min), respectively. The seepage velocity was previously reported at 2.86 feet/year. The hydraulic gradient was calculated at 0.055 ft/ft in a July 1, 2014 Groundwater Monitoring Report.*

2) Demonstrate the presence and magnitude of, or the absence of, any vertical hydraulic gradient at the site. If a vertical hydraulic gradient exists, show how its direction and magnitude are incorporated in the calculations demonstrating hydraulic control.

*Vertical gradients are not considered significant at this facility based on a review of file data.*



*\*\*Please note- per the Solicitation, migration of the dissolved plume has occurred to the south onto the Sonic Restaurant property. Sonic has denied physical access to the site; therefore, SCDHEC has requested the use of angled wells beneath McLees Road for treatment to the south of the site.*

3) Ground-water flow computer models (especially 2-D may view with potentiometric and flow lines) may be utilized and submitted. All calculations should be in English units. All model-derived data and maps should be properly labeled and keyed so as to be clearly understood.

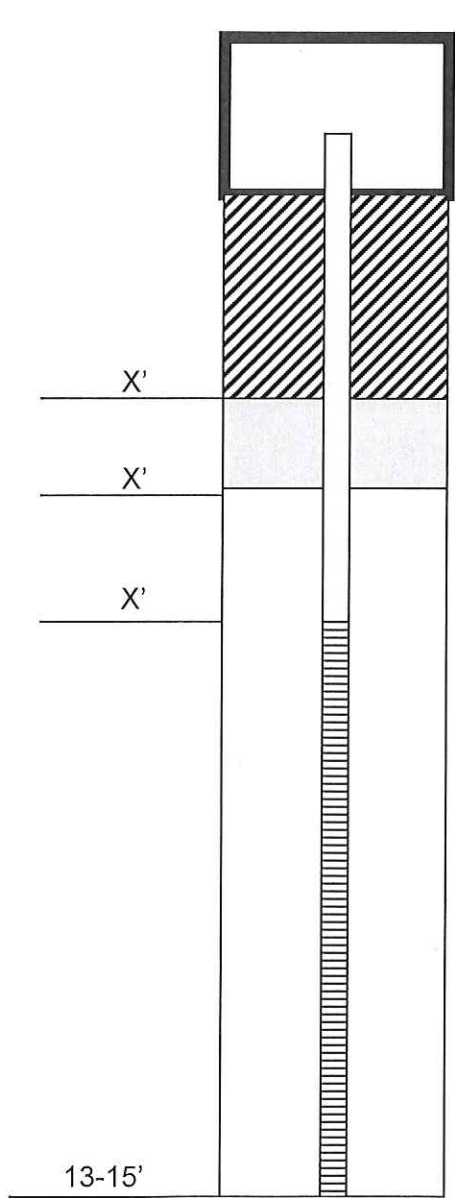
N/A

ATTACHMENT B: Well Construction Details

ENVIRORISK CONSULTANTS, INC.

INJECTION/EXTRACTION WELL CONSTRUCTION DETAILS (Example)

DRILLING FIRM:	SUPERVISING GEOLOGIST:
PROJECT NAME:	
PROJECT LOCATION:	
INJECTION WELL NO.:	DATE OF INSTALLATION:



COMPLETED WITH STEEL, BOLT-DOWN WELL VAULT

WELL RISER  
MATERIAL: PVC  
DIAMETER: 1 OR 2 INCH  
JOINT TYPE: FLUSH THREADED  
LENGTH: X FEET

SECOND SEAL  
TYPE OF SEAL: PORTLAND CEMENT  
THICKNESS: X FEET

FIRST SEAL  
TYPE OF SEAL: BENTONITE CHIPS  
THICKNESS: 2 FEET

FILTER PACK  
TYPE OF FILTER: SAND  
DISTANCE ABOVE SCREEN: 2 FEET

WELL SCREEN  
SCREEN MATERIAL: PVC  
DIAMETER: 1 or 2 INCH  
LENGTH: 5-10 FEET  
SLOT SIZE: 0.010 INCHES

DEPTH TO BOTTOM OF INJECTION WELL 13-15 FEET

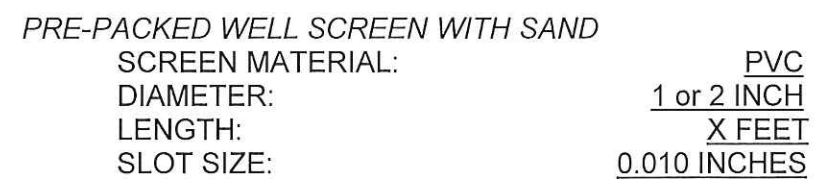


## ATTACHMENT B: Well Construction Details

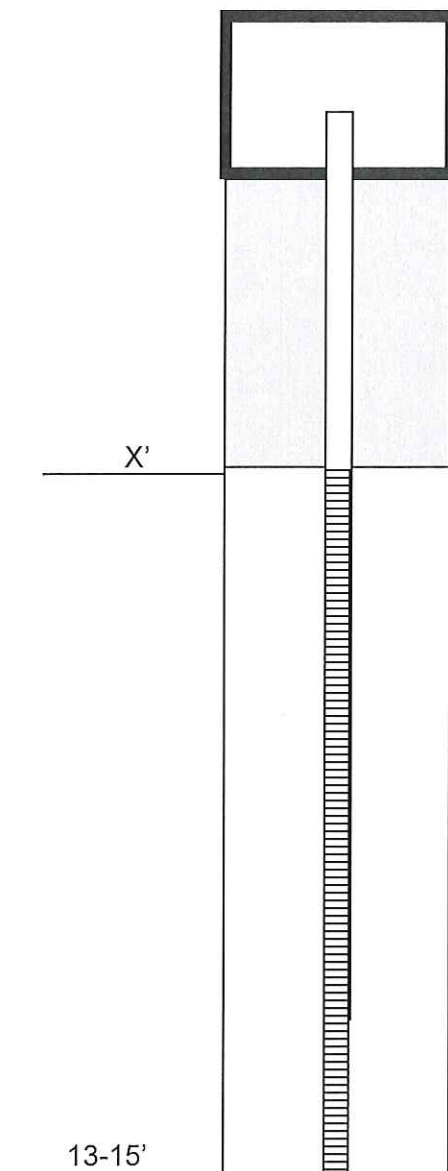
**ENVIRORISK CONSULTANTS, INC.**

### ANGLED INJECTION WELL CONSTRUCTION DETAILS (Example)

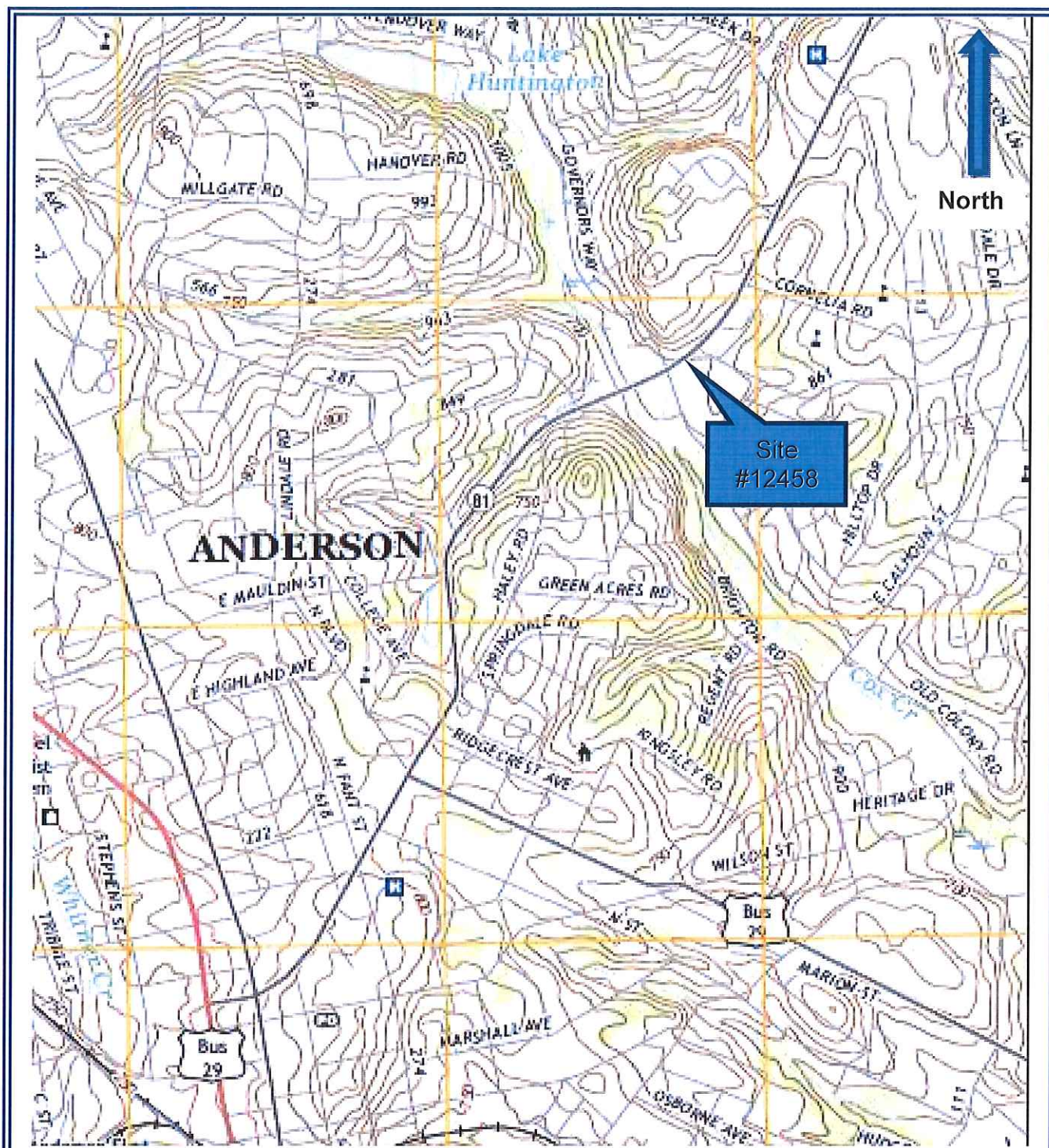
DRILLING FIRM:	SUPERVISING GEOLOGIST:
PROJECT NAME:	
PROJECT LOCATION:	
INJECTION WELL NO.:	DATE OF INSTALLATION:



*\*Well will be installed at an approximate 45-degree angle equaling a 15-foot depth below ground surface using approximately 21-feet of well pipe.*







**FIGURE 1. TOPOGRAPHIC MAP**



EnviroRisk Consultants, Inc.  
PO Box 945  
Grayson, GA 30017

**LEGEND**

Source: USGS Topo Map,  
Anderson Quad, 2017  
Approx. Scale: 1" = 1,100'

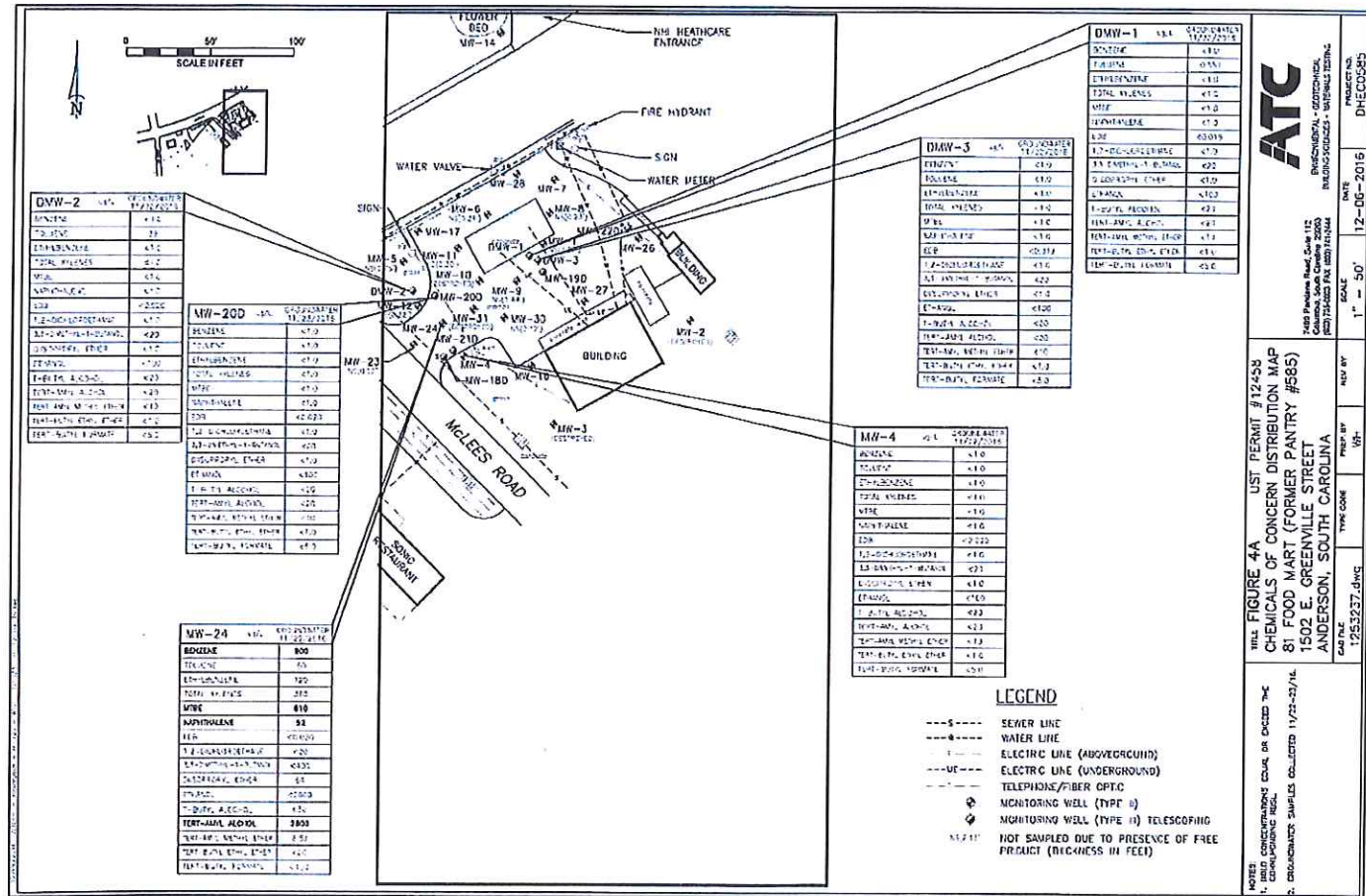
**SC DHEC UST Permit #12458**

Former 81 Food Mart  
1502 E. Greenville Street  
Anderson, SC 29621





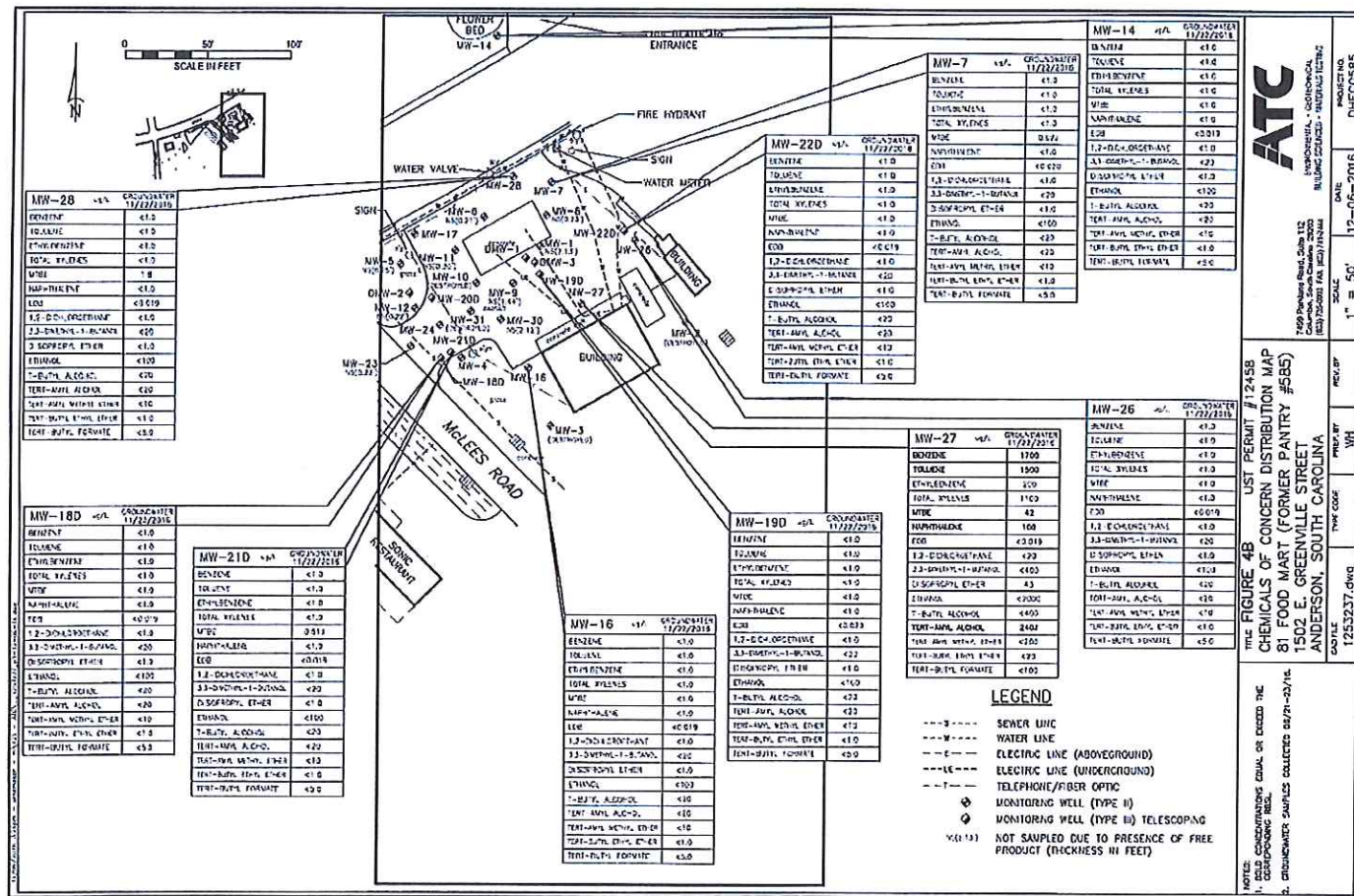
Figure 4A. Groundwater COC map, Nov. 2016



Source: SCDHEC technical file

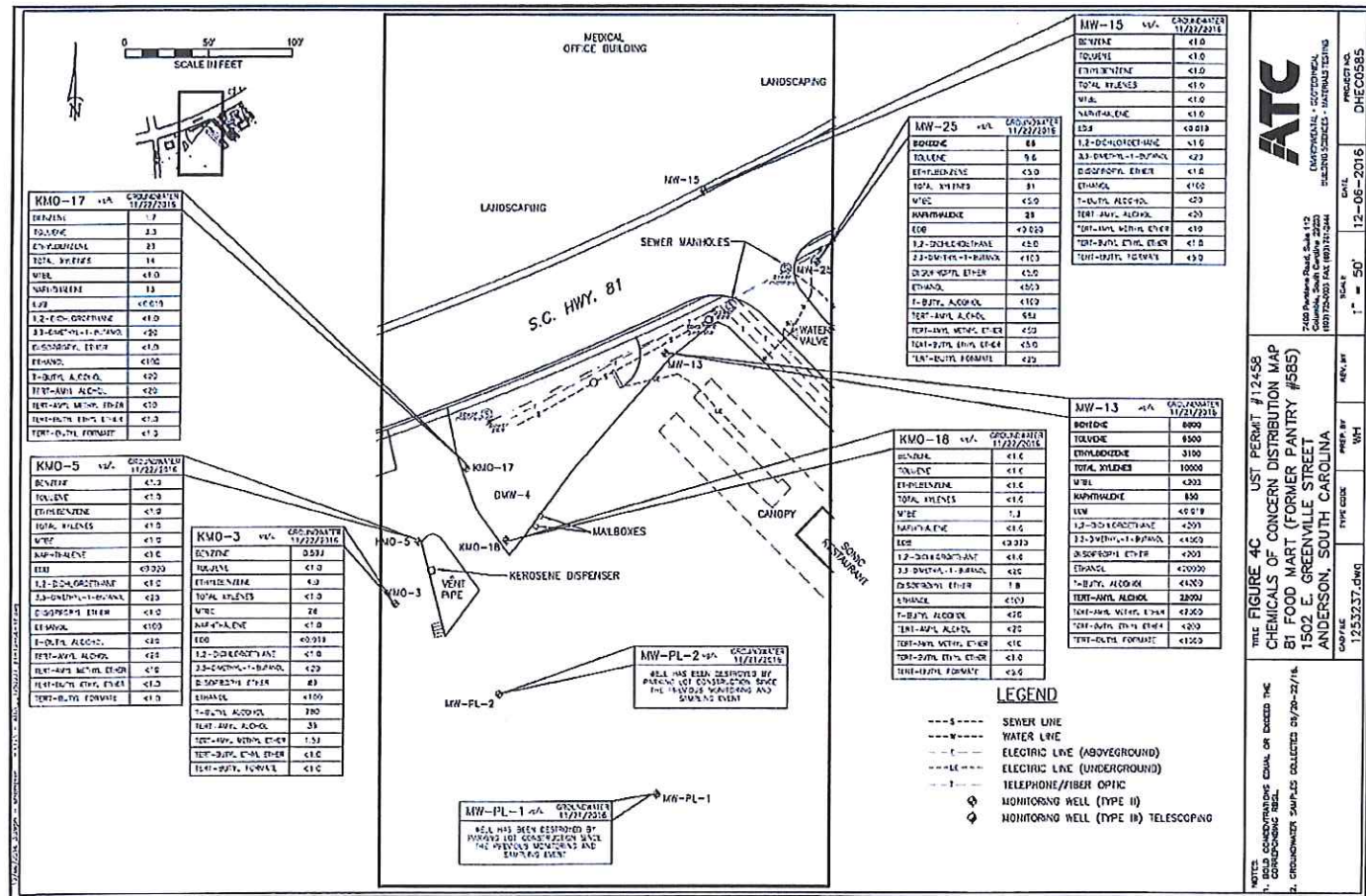


Figure 4B. Groundwater CoC map, Nov. 2016



Source: SCDHEC technical file

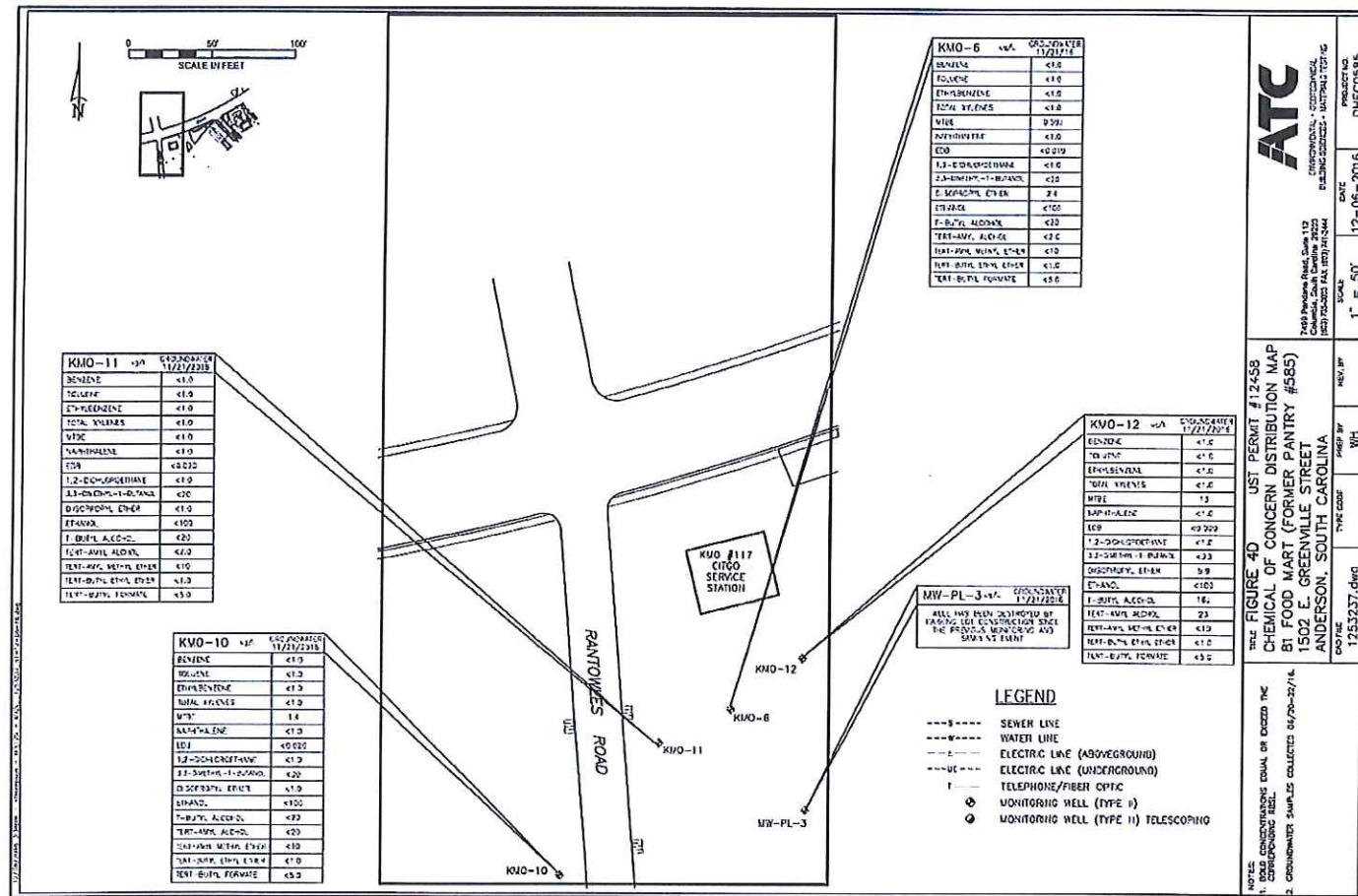
Figure 4C. Groundwater CoC map, Nov. 2016



Source: SCDHEC technical file

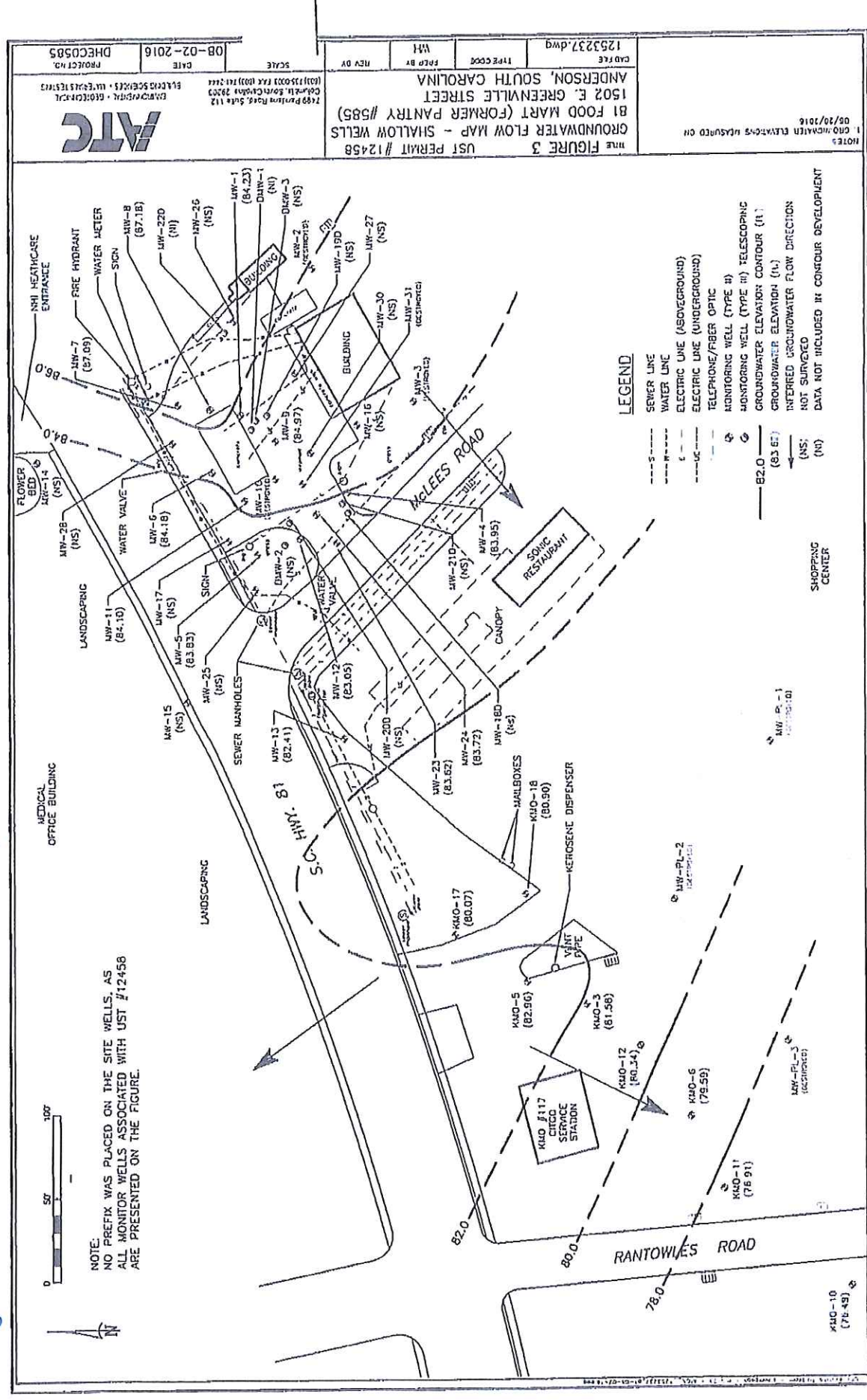


Figure 4D. Groundwater CoC map, Nov. 2016



Source: SCDHEC technical file

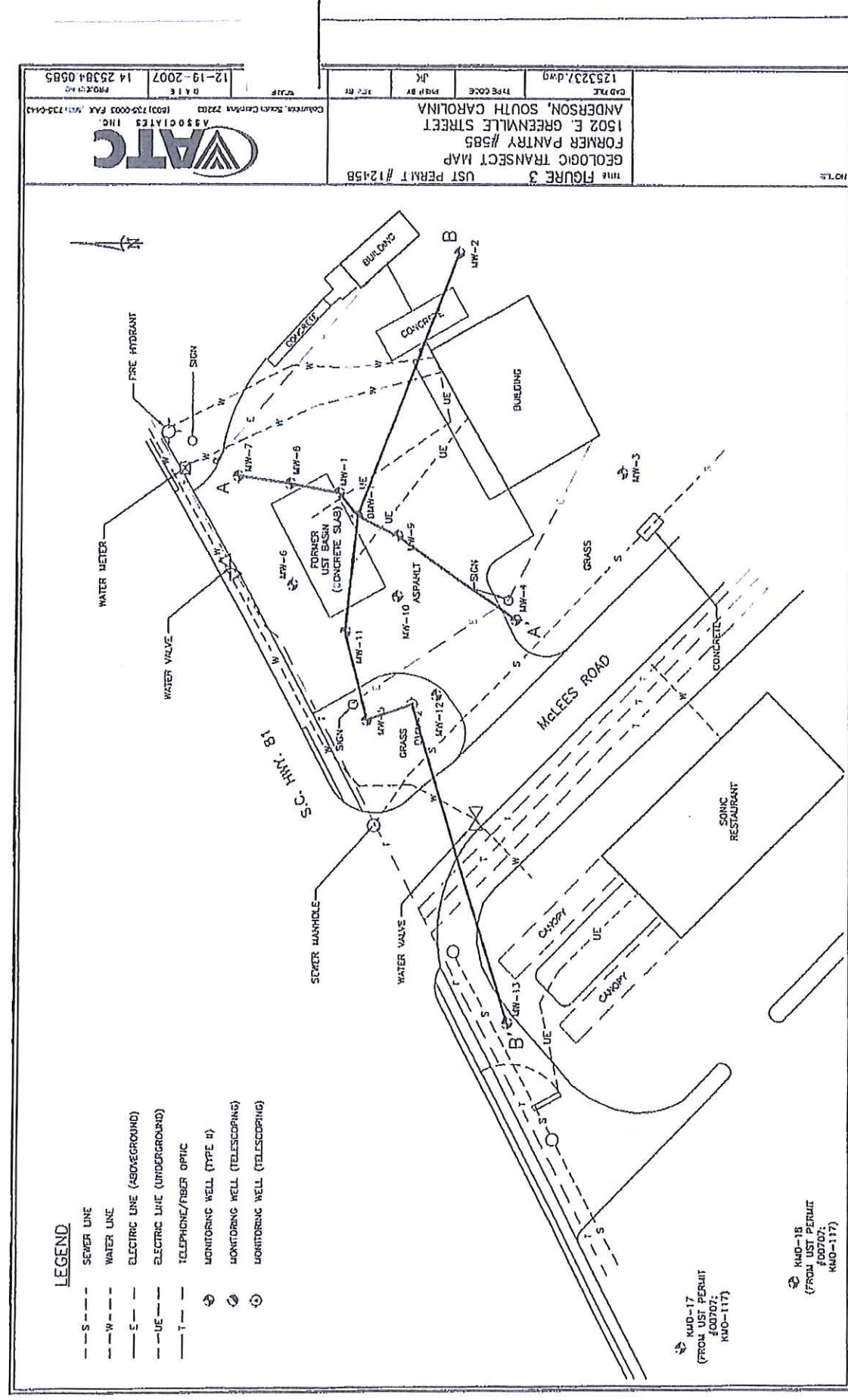
Figure 5. Site potential metric map



Source: SCDHEC Appendix file

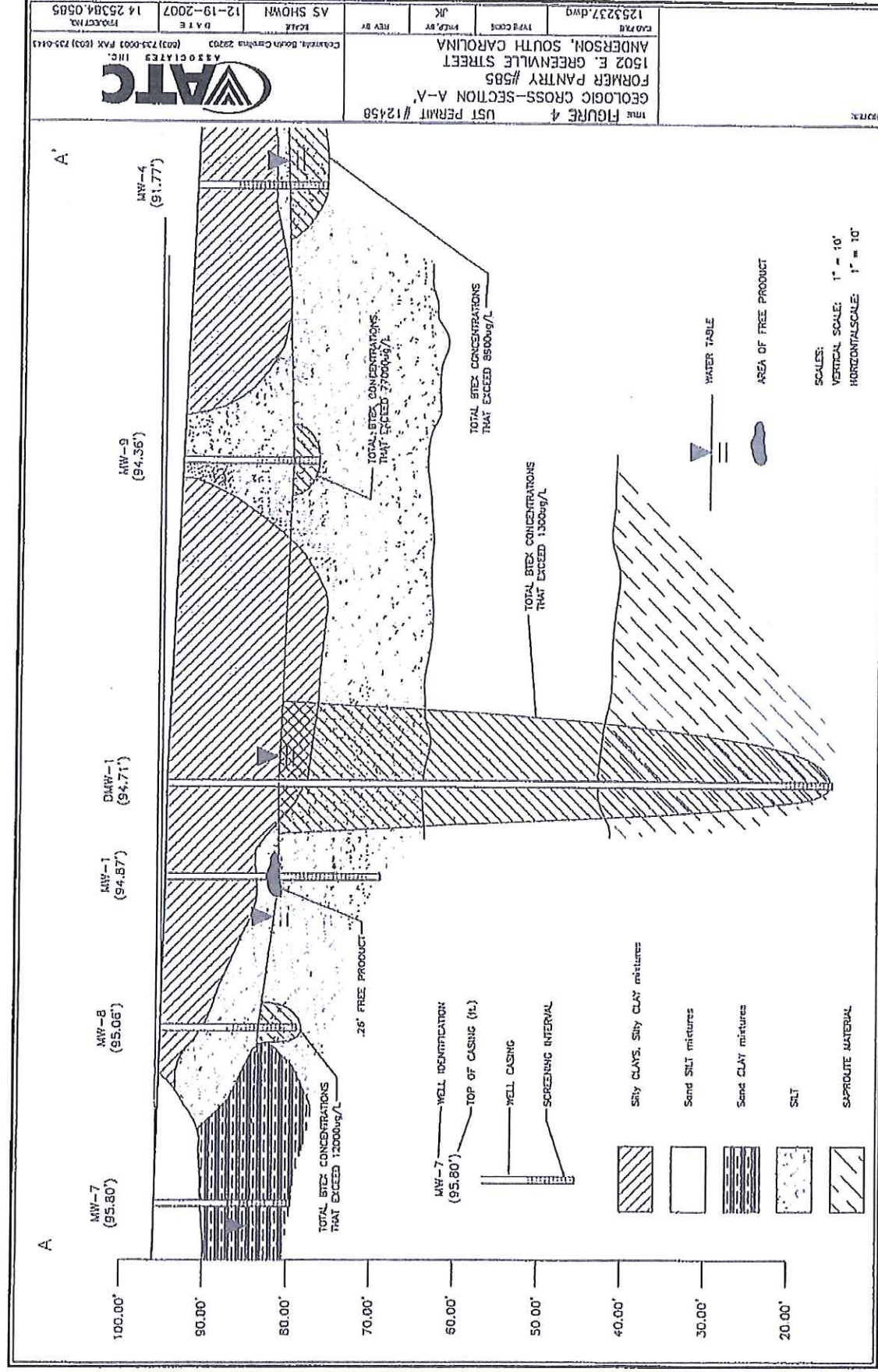


Figure 6A. Geologic Cross Section, Transect map



Source: SCDHEC Appendix file

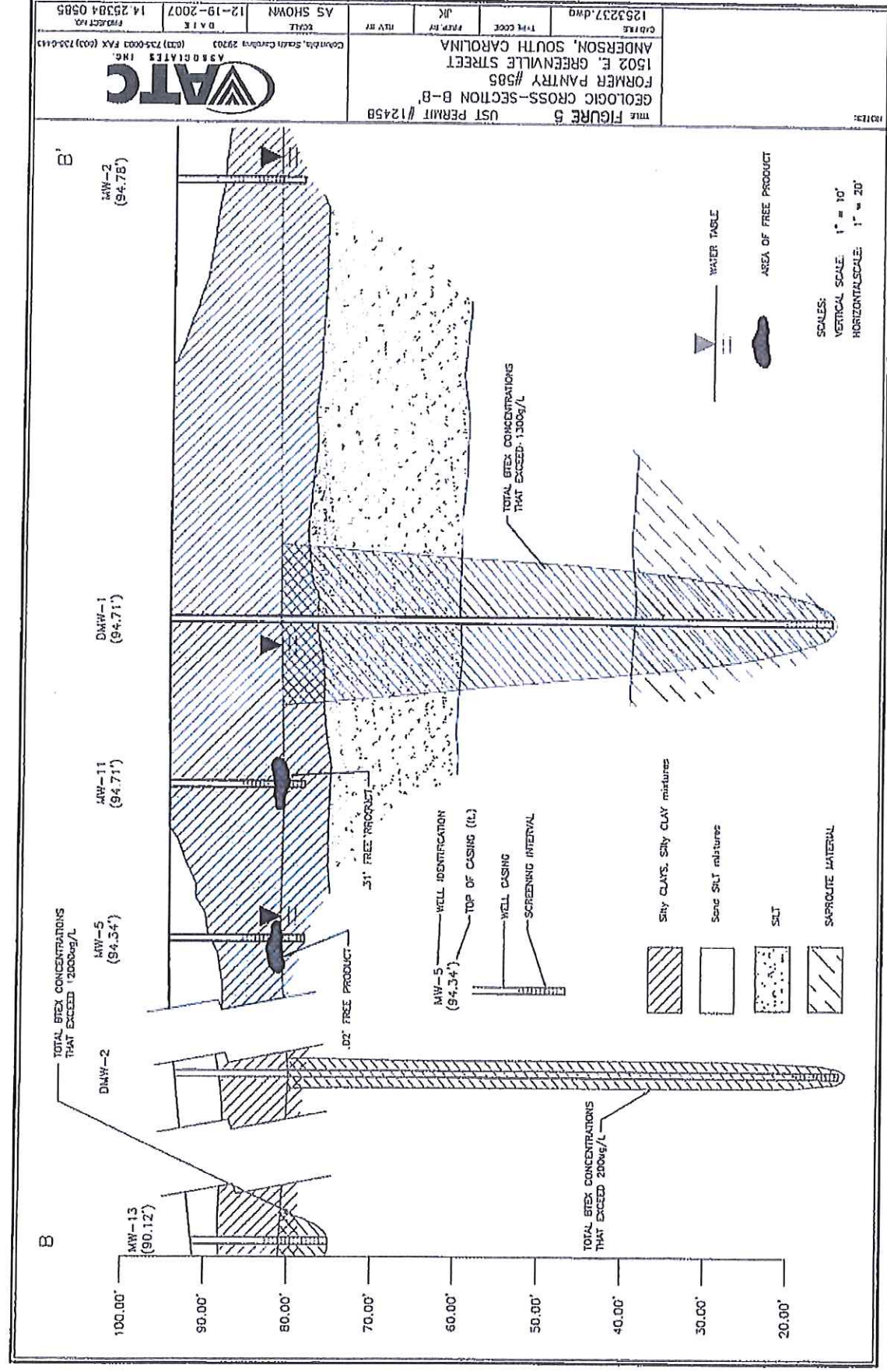
Figure 6B. Geologic Cross Section, A-A'



Source: SCDHEC Appendix file

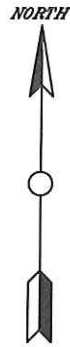


Figure 6c. Geologic Cross Section, B-B'



Source: SCDHEC Appendix file





FLOWER BED

MW-14

ENTRANCE

SIDEWALK

E. GREENVILLE STREET / S.C. HWY 81

GRASS

GRASS

PARKING LOT

PRO CLEANERS

GRASS

LABTECH DIAGNOSTICS

GRASS

MCLEES ROAD

GRASS

MW-13

SIDEWALK



**ENVIRORISK  
CONSULTANTS, INC.**

DATE: 8/2017  
DWN: MJA  
CHKD: KP  
APPR: KS

81 FOOD MART (FORMER PANTRY #585)  
UST PERMIT #12458  
1502 E. GREENVILLE STREET  
ANDERSON, SOUTH CAROLINA  
PROPOSED TREATMENT PLAN

FIGURE NO  
**7**

LEGEND

- ◆◆ TYPE III MONITORING WELL LOCATION
- ◆ MONITORING WELL LOCATION
- ◆ SSTL MONITORING WELL LOCATION
- PROPOSED INJECTION POINTS (7'-15')
- ✱ PROPOSED 2" INJECTION/EXTRACTION WELLS (SCREENED 5'-15')
- PROPOSED VERTICAL INJECTION/EXTRACTION WELLS (SCREENED 5'-20')

NOTES:  
\*MAP BASED ON ATC MAP DATED 8/2/2016  
\*WELL LOCATIONS ARE APPROXIMATE  
\*SSTL WELLS ARE SHOWN IN RED





# MATERIAL SAFETY DATA SHEET C-13 AOS-40

## 1. Product and Company Identification

Material name T Det AOS-40  
Version # 09  
Revision date 05-08-2012  
Chemical name Sodium Alpha Olefin Sulfonate  
Chemical description Organic Mixture  
CAS # Mixture  
MSDS Number 001133-09  
Manufacturer information Harcros Chemicals Inc  
5200 Speaker Rd.  
Kansas City, KS 66106 United States  
Main Telephone Number 1-913-321-3131  
CHEMTREC -For Emergencies Only 1-703-527-3887 (call collect)  
CHEMTREC -For Emergencies Only 1-800-424-9300

## 2. Hazards Identification

Emergency overview Irritating to eyes.  
OSHA regulatory status This product is considered not hazardous under 29 CFR 1910.1200 (Hazard Communication).  
Potential health effects  
Routes of exposure Eye contact.  
Eyes May cause eye irritation.  
Skin May be irritating to the skin.  
Inhalation May cause irritation of respiratory tract.  
Ingestion May be harmful if swallowed. May cause irritation, coughing, headache, nausea, vomiting, diarrhea.  
Potential environmental effects May cause long-term adverse effects in the environment.

## 3. Composition / Information on Ingredients

Non-hazardous components	CAS #	Percent
Water	7732-18-5	56 - 64
SULFONIC ACIDS, C14-16-ALKANE HYDROXY AND C14-16-ALKENE, SODIUM SALTS	68439-57-6	36 - 42
Sodium Chloride	7647-14-5	0 - 1
Sodium Sulphate	7757-82-6	0 - 1

## 4. First Aid Measures

First aid procedures  
Eye contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention if symptoms occur.  
Skin contact Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing separately before reuse. Call a physician if symptoms develop or persist.  
Inhalation If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms develop or persist.

Ingestion Rinse mouth. Drink plenty of water. Get medical attention if symptoms occur.  
General advice If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties The product is not flammable. No unusual fire or explosion hazards noted.  
Extinguishing media  
Suitable extinguishing media Dry chemical, CO2, or water spray. Foam.  
Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.  
Fire fighting equipment/instructions Evacuate the area promptly. As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Cool containers exposed to heat with water spray and remove container, if no risk is involved.  
Hazardous combustion products Carbon Oxides. Sulfur Oxides.

6. Accidental Release Measures

Personal precautions Keep unnecessary personnel away. Local authorities should be advised if significant spillages cannot be contained.  
Environmental precautions Prevent further leakage or spillage if safe to do so. Do not contaminate water.  
Methods for containment Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.  
Methods for cleaning up Should not be released into the environment.  
  
Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water.  
  
Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.  
  
Never return spills in original containers for re-use. For waste disposal, see section 13 of the MSDS.

7. Handling and Storage

Handling Avoid release to the environment. Do not breathe dust/fume/gas/mist/vapors/spray. Do not get in eyes, on skin, on clothing.  
Storage Keep away from food, drink and animal feedingstuffs. Keep away from heat, sparks and open flame. Keep container tightly closed and dry. Keep containers between 50 F. and 100F. Use care in handling/storage. Store in accordance with local/regional/national/international regulation.

8. Exposure Controls / Personal Protection

Personal protective equipment  
Eye / face protection Avoid contact with eyes. Wear safety glasses with side shields (or goggles). Eye Wash Fountain should be available.  
Skin protection Wear suitable protective clothing and gloves.  
Respiratory protection No personal respiratory protective equipment normally required. If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.  
General hygiene considerations Avoid contact with eyes. Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Appearance Yellow Amber  
Physical state Liquid.

Form	Liquid.
Color	Not available.
Odor	Slight.
Odor threshold	Not available.
pH	7 - 9
Vapor pressure	25 mm Hg @ 77 F.
Vapor density	Not available.
Boiling point	212 °F (100 °C)
Melting point/Freezing point	Not available.
Solubility (water)	Soluble in all portions
Specific gravity	1.05
Relative density	Not available.
Flash point	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Auto-ignition temperature	Not available.
Percent volatile	56 - 64 %

10. Chemical Stability & Reactivity Information

Chemical stability	Material is stable under normal conditions.
Conditions to avoid	Do not mix with other chemicals.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.
Possibility of hazardous reactions	Not established.

11. Toxicological Information

Toxicological data		
Product	Species	Test Results
T Det AOS-40 (Mixture)		
Acute		
<i>Dermal</i>		
LD50	Rabbit	6300 mg/kg, CAS# 68439-57-6
<i>Oral</i>		
LD50	Rat	10000 mg/kg, Sodium Sulfate (Solution) 2310 mg/kg, CAS# 68439-57-6
Components		
	Species	Test Results
Sodium Chloride (7647-14-5)		
Acute		
<i>Oral</i>		
LD50	Mouse	4000 mg/kg
	Rat	3000 mg/kg
<i>Other</i>		
LD50	Mouse	2602 mg/kg

Components	Species	Test Results
Sodium Sulphate (7757-82-6)		
Acute		
Other		
LD50	Rabbit	> 4 g/kg

\* Estimates for product may be based on additional component data not shown.

Local effects	May be irritating to eyes.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Further information	This product has no known adverse effect on human health.

## 12. Ecological Information

### Ecotoxicological data

Product	Species	Test Results
T Det AOS-40 (Mixture)		
Crustacea	EC50	Daphnia
		10.6146 mg/l, 48 hours, estimated
Components	Species	Test Results

Sodium Chloride (7647-14-5)		
Aquatic		
Crustacea	EC50	Water flea (Daphnia magna)
		340.7 - 469.2 mg/l, 48 hours
Fish	LC50	American eel (Anguilla rostrata)
		0 - 27260 mg/l, 96 hours

Sodium Sulphate (7757-82-6)		
Aquatic		
Crustacea	EC50	Water flea (Ceriodaphnia dubia)
		2807 - 3535 mg/l, 48 hours
Fish	LC50	Striped bass (Morone saxatilis)
		56 mg/l, 96 hours

SULFONIC ACIDS, C14-16-ALKANE HYDROXY AND C14-16-ALKENE, SODIUM SALTS (68439-57-6)		
Aquatic		
Crustacea	EC50	Water flea (Ceriodaphnia dubia)
		4.14 - 4.95 mg/l, 48 hours

\* Estimates for product may be based on additional component data not shown.

Ecotoxicity	This Product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004.
Environmental effects	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Persistence and degradability	Not available.
Chemical fate information	Readily Biodegradable.

## 13. Disposal Considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. This product, in its present state, when discarded or disposed of, is not a hazardous waste according to Federal regulations (40 CFR 261.4 (b)(4)). Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste. Dispose in accordance with all applicable regulations.
Waste from residues / unused products	Not applicable.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport Information

DOT  
Not regulated as dangerous goods.

IATA  
Not regulated as dangerous goods.

IMDG  
Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations  
This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.  
All components are on the U.S. EPA TSCA Inventory List.

CERCLA/SARA Hazardous Substances - Not applicable.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2)

Not regulated.

DEA Essential Chemical Code Number

Not regulated.

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated.

DEA Exempt Chemical Mixtures Code Number

Not regulated.

CERCLA (Superfund) reportable quantity  
None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories  
Immediate Hazard - Yes  
Delayed Hazard - No  
Fire Hazard - No  
Pressure Hazard - No  
Reactivity Hazard - No

Section 302 extremely hazardous substance

No

Section 311 hazardous chemical

No

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

\*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations	California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.
-------------------	--

US - Pennsylvania RTK - Hazardous Substances: Listed substance	
Sodium Sulphate (CAS 7757-82-6)	Listed.

16. Other Information

Further information	HMIS® is a registered trade and service mark of the NPCA.
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HMIS® ratings	Health: 2 Flammability: 0 Physical hazard: 0
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NFPA ratings	Health: 1 Flammability: 0 Instability: 0
--------------	--

Disclaimer	The information provided in this Material Safety data sheet has been obtained from sources believed to be reliable. Harsco Chemicals Inc provides no warranties, either expressed or implied and assumes no responsibility for the accuracy or completeness of the data contained herein. This information is offered for your information, consideration, and investigation. You should satisfy yourself that you have all current data relevant to your particular use. Harsco Chemicals Inc knows of no medical condition, other than those noted on this material safety data sheet, which are generally recognized as being aggravated by exposure to this product.
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Issue date	05-08-2012
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This data sheet contains changes from the previous version in section(s):	Product and Company Identification: Product and Company Identification Composition / Information on Ingredients: Ingredients Physical & Chemical Properties: Multiple Properties Toxicological Information: Toxicological Data Transport Information: Material Transportation Information Regulatory Information: United States
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PRODUCT NAME: HYDROGEN PEROXIDE 35% (ALLGRADES)  
MSDS NUMBER: 39247  
DATE ISSUED: 09/16/2008  
SUPERSEDES: 08/09/2006  
ISSUED BY: 008782

\*\*\*\*\*  
\*\*\*\*\*

## Material Safety Data Sheet

### 1. PRODUCT AND COMPANY IDENTIFICATION

#### Company

Arkema Inc.  
2000 Market Street  
Philadelphia, Pennsylvania 19103

#### Oxygenated and Derivatives

Customer Service Telephone Number:  
(800) 346-7575  
(Monday through Friday, 8:30 AM to 5:30 PM EST)

#### Emergency Information

Transportation:  
CHEMTREC: (800) 424-9300  
(24 hrs., 7 days a week)  
Medical:  
Rocky Mountain Poison Center: (303) 623-5716  
(24 hrs., 7 days a week)

#### Product Information

Product name: HYDROGEN PEROXIDE 35% (ALLGRADES)  
Synonyms: Not available  
Molecular formula: H2O2  
Chemical family: peroxides  
Molecular weight: 34.01 g/mol  
Product use: Bleaching agent, Oxidizing agent, Cosmetics,  
Water treatment

### 2. HAZARDS IDENTIFICATION

#### Emergency Overview

Color: colorless  
Physical state: liquid  
Odor: pungent

DANGER!  
STRONG OXIDIZER.  
CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE OR EXPLOSIVE DECOMPOSITION.  
CAUSES EYE BURNS.  
MAY CAUSE BLINDNESS.  
MAY CAUSE RESPIRATORY TRACT IRRITATION.  
MAY BE HARMFUL IF SWALLOWED.

Potential Health Effects

Primary routes of exposure:  
Inhalation and skin contact.

Signs and symptoms of acute exposure:  
Corrosive to the eyes. May cause irritation of respiratory tract. Effects due to ingestion may include: gastrointestinal symptoms, ulceration, burns, accumulation of fluid in the lungs which may be delayed for several hours.

Skin:  
Slightly toxic. Non-irritating. (based on animal studies)

Eyes:  
Corrosive. (based on animal studies)

Ingestion:  
Practically nontoxic to slightly toxic. (based on animal studies)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No.	Wt/Wt	OSHA Hazardous
Water	7732-18-5	65 %	N
Hydrogen peroxide (H2O2)	7722-84-1	35 %	Y

The substance(s) marked with a "Y" in the Hazard column above, are those identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

This material is classified as hazardous under Federal OSHA regulation.

4. FIRST AID MEASURES

Inhalation:  
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Skin:  
Immediately flush skin with large amounts of water. Remove material from clothing. Wash clothing before reuse. Destroy contaminated shoes.

Eyes:  
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Ingestion:  
If swallowed, DO NOT induce vomiting. Get medical attention immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

Notes to physician:  
Exposure to material may cause delayed lung injury resulting in pulmonary edema and pneumonitis. Exposed individuals should be monitored for 72 hours after exposure for the onset of delayed respiratory symptoms.

5. FIRE-FIGHTING MEASURES

Flash point                      None.

Auto-ignition temperature:    not applicable

Lower flammable limit (LFL):   not applicable

Upper flammable limit (UFL):   not applicable

Extinguishing media (suitable):  
water spray, water fog

Protective equipment:

Fire fighters and others who may be exposed to products of combustion should wear full fire fighting turn out gear (full Bunker Gear) and self-contained breathing apparatus (pressure demand / NIOSH approved or equivalent).

Further firefighting advice:

Fire fighting equipment should be thoroughly decontaminated after use.

Fire and explosion hazards:

Oxidizing Material

Explosive when mixed with combustible material.

Avoid breathing fumes from fire exposed material.

6. ACCIDENTAL RELEASE MEASURES

In case of spill or leak:

Stop the leak if you can do so without risk. Ventilate the area. Flush with plenty of water. Avoid contact with cellulose, paper, sawdust or similar substances. Risk of self-ignition or promotion of fires. Combustible materials exposed to hydrogen peroxide should be rinsed immediately with large amounts of water to ensure that all the hydrogen peroxide is removed. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits.

7. HANDLING AND STORAGE

Handling

General information on handling:

Do not get in eyes, on skin, or on clothing.

Do not taste or swallow.

Avoid breathing vapor or mist.

Wash thoroughly after handling.

Use only with adequate ventilation.

Avoid contamination.

Keep from contact with clothing and other combustible materials.

Store in tightly closed container.

Emptied container retains vapor and product residue.

Observe all labeled safeguards until container is cleaned, reconditioned or destroyed.

DO NOT CUT, DRILL, GRIND, OR WELD ON OR NEAR THIS CONTAINER.

Storage

General information on storage conditions:

Store away from combustibles and incompatible materials. Store in cool, dry, well ventilated area away from sources of ignition such as flame, sparks and static electricity. Refer to National Fire Protection Association (NFPA) 43A, Code for the Storage of Solid and Liquid Oxidizers.

Storage incompatibility General:

Store separate from acids, alkalies, reducing agents, and combustibles. Store separate from:

Organic materials

Metallic oxides

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Hydrogen peroxide (H2O2) (7722-84-1)

US. ACGIH Threshold Limit Values

Time Weighted Average (TWA): 1 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

PEL: 1 ppm (1.4 mg/m3)

Only those components with exposure limits are printed in this section. Limits with skin contact designation above have skin contact effect. Air sampling alone is insufficient to accurately quantitate exposure. Measures to prevent significant cutaneous absorption may be required. Limits with a sensitizer designation above mean that exposure to this material may cause allergic reactions.

#### Engineering controls:

Investigate engineering techniques to reduce exposures below airborne exposure limits. Provide ventilation if necessary to control exposure levels below airborne exposure limits (see above). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment. Consult ACGIH ventilation manual or NFPA Standard 91 for design of exhaust systems.

#### Respiratory protection:

Avoid breathing vapor or mist. When airborne exposure limits are exceeded, use NIOSH approved respiratory protection equipment appropriate to the material and/or its components. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical goggles. Consult respirator manufacturer to determine appropriate type equipment for a given application. Observe respirator use limitations specified by NIOSH or the manufacturer. For emergency and other conditions where exposure limits may be significantly exceeded, use an approved full face positive-pressure, self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply. Respiratory protection programs must comply with 29 CFR 1910.134.

#### Skin protection:

Wear appropriate chemical resistant protective clothing and chemical resistant gloves to prevent skin contact.

When handling this material, gloves of the following type(s) should be worn:

Neoprene

Polyvinylchloride

Impervious butyl rubber gloves

Wear a face shield, chemical goggles and chemical resistant clothing such as an approved splash protective suit made of SBR Rubber, PVC, Gore-Tex or a HAZMAT Splash Protective Suit (Level A, B, or C) when splashing may occur (such as connecting/disconnecting, mechanical first break). For foot protection, wear boots made of NBR, PVC, polyurethane, or neoprene. Overboots made of Latex or PVC, as well as firefighter boots or specialized HAZMAT boots are also permitted. DO NOT wear any form of boot or overboots made of nylon or nylon blends. DO NOT use cotton, wool or leather, as these materials react RAPIDLY with higher concentrations of hydrogen peroxide. Rinse immediately if skin is contaminated. Remove contaminated clothing and shoes immediately. Thoroughly rinse the outside of gloves and protective clothing with water prior to removal. Completely submerge hydrogen peroxide contaminated clothing or other materials in water prior to drying. Residual hydrogen peroxide, if allowed to dry on materials such as paper, fabrics,

Univar Usa FaxServer 7/14/2009 7:38:25 AM PAGE 6/010 FaxServer  
cotton, leather, wood or other combustibles can cause the material to ignite  
and result in a fire. Clean protective equipment before reuse. Provide a  
safety shower at any location where skin contact can occur. Wash thoroughly  
after handling.

Eye protection:

Where there is potential for eye contact, wear a face shield, chemical  
goggles, and have eye flushing equipment immediately available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color: colorless  
Physical state: liquid  
Odor: pungent  
pH: no data available  
Density: 1.13 g/cm3 (68 deg F (20 deg C))  
Vapor pressure: 24 mmHg (68 deg F (20 deg C))  
Relative vapor density: 1.0  
Vapor density: not determined  
Boiling point/boiling: 226 deg F (108 deg C) range:  
Freezing point: -27 deg F (-33 deg C)  
Solubility in water: completely soluble  
% Volatiles: 100 %  
Molecular weight: 34.01 g/mol  
Henry's constant: (Concentration: 50%) 1.00E-02

10. STABILITY AND REACTIVITY

Stability:

This material is chemically stable under normal and anticipated storage,  
handling and processing conditions.

Materials to avoid:

Metals  
Organic materials  
Reducing agents  
Metallic oxides  
Bases  
Dusts  
Combustible materials (e.g., wood, sawdust)

Conditions / hazards to avoid:

Material decomposes with the potential to produce a rupture of unvented  
closed containers.

Hazardous decomposition products:

This material decomposes if contaminated, causing fire and possible  
explosions. Oxygen can be liberated at temperatures above ambient.

11. TOXICOLOGICAL INFORMATION

Data on this material and/or its components are summarized below.

Data for HYDROGEN PEROXIDE 35% (ALLGRADES)

Acute toxicity

Oral:

Practically nontoxic. (rat) LD50 >5000 mg/kg (10%) .

Slightly toxic. (rat) LD50 = 1200 mg/kg (35%) .

Dermal:

Slightly toxic. (rat) LD50 >2000 mg/kg (35%) .

Skin Irritation:



Non-irritating. (rabbit) (35 %)

Eye Irritation:

Corrosive. (rabbit) (10 %)

Corrosive. (rabbit) (35 %)

Repeated dose toxicity

Repeated drinking water administration to rat and mouse / affected organ(s):

GI tract / signs: irritation

Repeated inhalation administration to rat and mouse / affected organ(s): nose  
/ signs: irritation

Repeated inhalation administration to dog / affected organ(s): upper  
respiratory tract, lung / signs:  
irritation, emphysema

Chronic oral administration to laboratory animal / affected organ(s): stomach  
/ signs: ulceration

Carcinogenicity

Chronic drinking water administration to rat and mouse / affected organ(s):

GI tract / Increased incidence of tumors was reported.

Classified by the International Agency for Research on Cancer as: Group 3:

Unclassifiable as to carcinogenicity in humans.

Genotoxicity

Assessment in Vitro:

Genetic changes were observed in laboratory tests using: bacteria, animal  
Cells

Assessment in Vivo:

No genetic changes were observed in laboratory tests using: animals

Human experience

Inhalation:

Throat: irritation. (based on reports of occupational exposure to workers)

Skin contact:

Skin: bleaching of hair. (based on reports of occupational exposure to  
workers) Eye contact:

Eye: irritating. (based on reports of occupational exposure to workers)

Ingestion:

GI tract: bloating, ulceration, burns. (accidental exposure to concentrated  
solutions) Lung: accumulation of fluid in the lungs, death.

## 12. ECOLOGICAL INFORMATION

Chemical Fate and Pathway

No data are available.

Ecotoxicology

Data for HYDROGEN PEROXIDE 35% (ALLGRADES)

Aquatic toxicity data:

Slightly toxic. Fish 96 h LC50 between 10 - 37 mg/L

Aquatic invertebrates:

Moderately toxic. Daphnia magna (Water flea) EC50 = 7.7 mg/L

Moderately toxic. Daphnia pulex (Water flea) EC50 = 2.4 mg/L

Microorganisms:  
Slightly toxic. Bacteria EC50 = 30 mg/L

### 13. DISPOSAL CONSIDERATIONS

#### Waste disposal:

Dilution with water is the preferred method of disposal. Dispose of in accordance with federal, state and local regulations. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits.

Note: Chemical additions to, processing of, or otherwise altering this material may make this waste management information incomplete, inaccurate, or otherwise inappropriate. Furthermore, state and local waste disposal requirements may be more restrictive or otherwise different from federal laws and regulations.

### 14. TRANSPORT INFORMATION

US Department of Transportation (DOT)

UN Number : 2014  
Proper shipping name : Hydrogen peroxide, aqueous solutions  
Class : 5.1  
Subsidiary hazard class : (8)  
Packaging group : II  
Marine pollutant : no

International Maritime Dangerous Goods Code (IMDG)

UN Number : 2014  
Proper shipping name : HYDROGEN PEROXIDE, AQUEOUS SOLUTION  
Class : 5.1  
Subsidiary hazard class : (8)  
Packaging group : II  
Marine pollutant : no

### 15. REGULATORY INFORMATION

#### Chemical Inventory Status

EU. EINECS	EINECS	Conforms to
US. Toxic Substances Control Act	TSCA	The components of this product are all on the TSCA Inventory.
Australia. Industrial Chemical (Notification and Assessment) Act	AICS	Conforms to
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL). (Can. Gaz. Part II, Vol. 133)	DSL	All components of this product are on the Canadian DSL list.
Japan. Kashin-Hou Law List	ENCS (JP)	Does not conform
Korea. Toxic Chemical Control Law (TCCL) List	KECI (KR)	Conforms to
Philippines. The Toxic Substances and Hazardous	PICCS (PH)	Does not conform

China. Inventory of INV (CN) Does not conform  
Existing Chemical Substances

New Zealand. Inventory NZIOC Conforms to  
of Chemicals (NZIOC), as  
published by ERMA New Zealand

United States Federal Regulations

SARA Title III Section 302 Extremely Hazardous Chemicals:

Chemical Name	CAS-No.	SARA Reportable Quantities	SARA Threshold Planning Quantity
Hydrogen peroxide (H2O2)	7722-84-1	1000 lbs	1000 lbs

SARA Title III - Section 311/312 Hazard Categories:  
Acute Health Hazard, Fire Hazard, Reactivity Hazard

SARA Title III Section 313 Toxic Chemicals:  
SARA 313: This material does not contain any chemical components with known  
CAS numbers that exceed the threshold (De Minimis) reporting levels  
established by SARA Title III, Section 313.

Comprehensive Environmental Response, Compensation, and Liability Act  
(CERCLA) - Reportable Quantity (RQ):

The components in this product are either not CERCLA regulated, regulated but  
present in negligible concentrations, or regulated with no assigned  
reportable quantity.

OSHA Regulated Carcinogens (NTP, IARC, OSHA Listed):

NTP:  
No component of this product present at levels greater than or equal to 0.1%  
is identified as a known or anticipated carcinogen by NTP.

IARC:  
No component of this product present at levels greater than or equal to 0.1%  
is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA:  
No component of this product present at levels greater than or equal to 0.1%  
is identified as a carcinogen or potential carcinogen by OSHA.

United States State Regulations

Massachusetts Right to Know

Chemical Name	CAS-No.
Hydrogen peroxide (H2O2)	7722-84-1

Massachusetts Right to Know Extraordinarily Hazardous Substance(s)

Chemical Name	CAS-No.
Hydrogen peroxide (H2O2)	7722-84-1

New Jersey Right to Know

Chemical Name	CAS-No.
Hydrogen peroxide (H2O2)	7722-84-1

New Jersey Right to Know Special Health Hazard Substance(s)

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Chemical Name CAS-No.  
Hydrogen peroxide (H2O2) 7722-84-1

Pennsylvania Right to Know

Chemical Name CAS-No.  
Hydrogen peroxide (H2O2) 7722-84-1

Water 7732-18-5

Pennsylvania Right to Know Environmentally Hazardous Substance(s)

Chemical Name CAS-No.  
Hydrogen peroxide (H2O2) 7722-84-1

California Prop. 65

This product does not contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive defects.

#### 16. OTHER INFORMATION

##### Miscellaneous:

Other information: This MSDS covers the following grades of 35% H2O2: Albione; Peroxal; Valsterane; AG; B10; CG; CG-HP; CLG; MS; FG; ASG; EG.

----- FOR ADDITIONAL INFORMATION -----  
CONTACT: MSDS COORDINATOR UNIVAR USA INC.  
DURING BUSINESS HOURS, PACIFIC TIME (425)889-3400  
----- NOTICE -----

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\* \* \* E N D O F M S D S \* \* \*

MATERIAL SAFETY DATA SHEET REGULATORY DATA

FILE UPDATE: 07/12/2013

MSDS VERSION DATE: 1-3-2013

PRODUCT CODE: 101082

ORIGINAL ENTRY: 12/26/1990

DESCRIPTION: Sodium Percarbonate

CAS Number and Names of Primary Chemical and/or its Components

15630-89-4 Sodium Percarbonate

100.00

Section 313 Regulated Substances

Regulating Authority

Extremely Hazardous Substance subject to section 302 emergency planning and notification requirements (EHS)

NO

Hazardous chemical and/or components subject to section 311 and 312 MSDS and inventory requirements (OSH)

YES

Toxic chemical and/or components subject to toxic chemical release reporting under Section 313 (TOXIC)

NO

Hazardous contents subject to section 304 spill reporting of Comprehensive Environmental Liability Act (CERCLA)

No

Subject to the reporting requirements of the EPA Toxicity Characteristic Leaching Process (CFR40 261.24)

NO

This product, or its components, are listed on or are exempt from the Toxic Substance Control Act (TSCA)

YES

Contains a Toxic Air Pollutant listed under the 1990 Clean Air Act Ammendments [42 USC sec 7412(b)(1)]

NO

Subject to the EPA Risk Management Program under Section 112(r) of the Clean Air Act and 40 CFR Part 68

NO

SARA Title III Hazard Categories

Fire Hazard

NO

Reactivity Hazard

NO

Sudden Release of Pressure

NO

Acute (immediate health hazard)

YES

Chronic (delayed health hazard)

NO

Extremely Hazardous Substance

NO

Department of Transportation Data

Sodium carbonate peroxyhydrate

Hazard Class:

5.1

ID Number:

UN3378

ERG Guide #:

140

Packing Group:

II

RQ Pounds:

HMIS & NFPA Hazard Ratings

H

Health

1

M

Flammability

1

I

Reactivity

2

S

PPE

N

Health

F

Flammability

P

Reactivity

A

Special



POTENTIAL HAZARDS

FIRE OR EXPLOSION

- These substances will accelerate burning when involved in a fire.
- Some may decompose explosively when heated or involved in a fire.
- May explode from heat or contamination.
- Some will react explosively with hydrocarbons (fuels).
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- Containers may explode when heated.
- Runoff may create fire or explosion hazard.

HEALTH

- Inhalation, ingestion or contact (skin, eyes) with vapors or substance may cause severe injury, burns or death.
- Fire may produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY

- **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
- Structural firefighters' protective clothing will only provide limited protection.

EVACUATION

Large Spill

- Consider initial downwind evacuation for at least 100 meters (330 feet).

- Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE

FIRE

Small Fire

- Use water. Do not use dry chemicals or foams. CO2 or Halon® may provide limited control.

Large Fire

- Flood fire area with water from a distance.
- Do not move cargo or vehicle if cargo has been exposed to heat.
- Move containers from fire area if you can do it without risk.

**Fire involving Tanks or Car/Trailer Loads**

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

**SPILL OR LEAK**

- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- Do not get water inside containers.

**Small Dry Spill**

- With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

**Small Liquid Spill**

- Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.

**Large Spill**

- Dike far ahead of liquid spill for later disposal.
- **Following product recovery, flush area with water.**

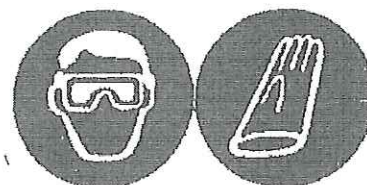
**FIRST AID**

- Move victim to fresh air.
- Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Contaminated clothing may be a fire risk when dry.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.



20 Buckingham Court, Cartersville, GA 30120  
770-386-3555/Fax 770-386-2009

**MATERIAL SAFETY DATA SHEET**  
**SODIUM CARBONATE PEROXYHYDRATE**



Product      MSDS No.  
US25              001

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION  
SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS  
SECTION 3: HAZARDS IDENTIFICATION  
SECTION 4: FIRST AID MEASURES  
SECTION 5: FIRE FIGHTING MEASURES  
SECTION 6: ACCIDENTAL RELEASE MEASURES  
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SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES  
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SECTION 14: TRANSPORT INFORMATION  
SECTION 15: REGULATORY INFORMATION  
SECTION 16: ADDITIONAL INFORMATION  
SECTION 17: LABEL INFORMATION

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SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

SUPPLIER.....Chemical Specialty Group, Inc.

EMERGENCY PHONE NUMBER(S) :CHEM-TEL 1-800-255-3924  
REVISION DATE.....01/03/2013  
REVISION.....NEW PRODUCT ENTRY  
TRADE NAMES/SYNONYMS:.....PEROXY SODIUM CARBONATE; SODIUM PERCARBONATE;  
SODIUM CARBONATE PEROXIDE.  
CHEMICAL FAMILY.....SODIUM SALT OF CARBONIC ACID/HYDROGEN PEROXIDE  
PRODUCT USE.....BLEACHING AGENT, ANTISEPTIC, DENTURE CLEANER.  
CHEMICAL FORMULA.....2Na-CO3.3H2O2  
HAZARD RATING  
FIRE.....1  
HEALTH.....1  
REACTIVITY.....2

## SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT	% CONC.	C.A.S.	ACGIH-TLV	OSHA-PEL
SODIUM CARBONATE PEROXYHYDRATE	98-100	15630-89-4	10 MG/M3 TWA INHALABLE PARTICLES	15 MG/M3 TWA TOTAL DUST
			3 MG/M3 TWA RESPIRABLE PARTICULATE	5 MG/M3 TWA RESPIRABLE FRACTION
			PARTICLES NOT OTHERWISE SPECIFIED (PNOC)	PARTICLES NOT OTHERWISE REGULATED (PNOR)

## SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW.....PRODUCT IS WHITE HYGROSCOPIC CRYSTALS.  
OXIDIZER. MAY BE HARMFUL OR FATAL IF SWALLOWED  
OR INHALED. MAY CAUSE SEVERE EYE AND  
RESPIRATORY TRACT IRRITATION OR BURNS. MAY  
CAUSE SKIN IRRITATION. CONTACT WITH OTHER  
MATERIALS MAY CAUSE FIRE.

### POTENTIAL HEALTH EFFECTS:

INGESTION.....VOMITING AND DIARRHEA.  
SKIN CONTACT.....MAY CAUSE SKIN IRRITATION AND REDNESS.  
INHALATION.....IRRITATING TO THE RESPIRATORY TRACT.  
COUGHING, SNEEZING, DIFFICULTY BREATHING AND  
SORE THROAT.  
EYE CONTACT.....MAY CAUSE IRRITATION TO THE EYES, INCLUDING  
PAIN, REDNESS AND REVERSIBLE DAMAGE.

### MEDICAL CONDITIONS



AGGRAVATED.....PERSONS WITH CHRONIC RESPIRATORY OR SKIN  
DISEASES.  
SUBCHRONIC (TARGET ORGAN)  
EFFECTS.....NO DATA  
CHRONIC EFFECTS.....NO DATA  
CARCINOGENICITY  
NTP.....NO  
IARC.....NO  
OSHA.....NO  
OTHER TOXICOLOGICAL DATA....NO DATA  
PRINCIPAL ROUTES OF ENTRY...EYE CONTACT  
SKIN CONTACT  
INHALATION

---

SECTION 4: FIRST AID MEASURES

EYE CONTACT.....WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF  
WATER OR NORMAL SALINE, OCCASIONALLY LIFTING  
UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF  
CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). GET  
MEDICAL ATTENTION IMMEDIATELY.  
SKIN CONTACT.....REMOVE CONTAMINATED CLOTHING AND SHOES  
IMMEDIATELY. WASH WITH SOAP OR MILD DETERGENT  
AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF  
CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). GET  
MEDICAL ATTENTION IMMEDIATELY.  
INHALATION.....IMMEDIATELY REMOVE VICTIM TO FRESH AIR, IF  
VICTIM IS NOT BREATHING A QUALIFIED PERSON  
SHOULD IMMEDIATELY BEGIN ARTIFICIAL  
RESPIRATION, OBTAIN IMMEDIATE MEDICAL  
ASSISTANCE !  
INGESTION.....OBTAIN IMMEDIATE MEDICAL ASSISTANCE - DO NOT  
INDUCE VOMITING. IF VOMITING OCCURS  
SPONTANEOUSLY, KEEP HEAD BELOW HIPS TO AVOID  
ASPIRATION.  
NOTE TO PHYSICIAN.....TREAT SYMPTOMATICALLY

---

SECTION 5: FIRE FIGHTING MEASURES

FLASH POINT.....NONE  
METHOD.....NOT APPLICABLE  
IGNITION TEMPERATURE.....NOT APPLICABLE  
UPPER FLAMMABLE LIMIT.....NOT APPLICABLE  
LOWER FLAMMABILITY LIMIT...NOT APPLICABLE  
SENSITIVITY TO MECHANICAL  
IMPACT.....NO  
SENSITIVITY TO STATIC  
DISCHARGE.....NOT EXPECTED  
EXTINGUISHING MEDIA.....USE SUITABLE EXTINGUISHING AGENTS FOR

SURROUNDING FIRE.

SPECIAL FIREFIGHTING  
PROCEDURES,.....EVACUATE AREA AND FIGHT FIRE FROM A SAFE  
DISTANCE. AS IN ANY FIRE, WEAR SELF-CONTAINED  
BREATHING APPARATUS PRESSURE-DEMAND, AND FULL  
PROTECTIVE GEAR.

FLAMMABILITY CLASS (OSHA)...NOT APPLICABLE

---

## SECTION 6: ACCIDENTAL RELEASE MEASURES

ACTION TO BE TAKEN FOR  
SPILLS OR RELEASES.....DO NOT TOUCH SPILLED MATERIAL. STOP FLOW OF  
MATERIAL, IF THIS IS WITHOUT RISK. PREVENT  
MATERIAL FROM ENTERING SEWERS AND WATERWAYS.  
ENSURE CLEAN-UP IS CONDUCTED BY TRAINED  
PERSONNEL. WEAR APPROPRIATE PERSONAL  
PROTECTIVE EQUIPMENT.  
SHOVEL INTO CLEAN, DRY LABELED CONTAINERS. USE  
EXTREME CARE TO PREVENT CONTAMINATION WITH  
COMBUSTIBLE OR ORGANIC MATERIALS.  
KEEP UNNECESSARY PERSONNEL AWAY. CLOSE OFF  
AREA.

---

## SECTION 7: HANDLING AND STORAGE

HANDLING PROCEDURES.....AVOID GETTING IN EYES, ON SKIN OR ON CLOTHING.  
AVOID BREATHING FUMES OR DUST FROM THIS  
MATERIAL. AVOID GENERATION OF MIST OR DUST. USE  
THIS PRODUCT ONLY WITH ADEQUATE VENTILATION.  
PREVENT CONTACT WITH COMBUSTIBLE OR ORGANIC  
MATERIALS. LABEL CONTAINERS AND KEEP THEM  
TIGHTLY CLOSED WHEN NOT IN USE. WASH THOROUGHLY  
AFTER HANDLING.

STORAGE PROCEDURES.....STORE IN TIGHTLY CLOSED CONTAINERS IN A CLEAN,  
DRY, WELL-VENTILATED AREA. STORE AWAY FROM  
SOURCES OF HEAT, INCOMPATIBLE MATERIALS, AND  
COMBUSTIBLE MATERIALS.

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## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS.....DESIGN AND IMPLEMENT CONTROLS AND PROCEDURES TO  
AVOID ACCUMULATION OF DUST.

EXPOSURE LIMITS.....SEE SECTION 2 - SPECIFIC INGREDIENTS  
RESPIRATORY PROTECTION.....THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED  
ON CONTAMINATION LEVELS FOUND IN THE WORK  
PLACE, MUST NOT EXCEED THE WORKING LIMITS OF  
THE RESPIRATOR AND BE JOINTLY APPROVED BY THE  
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND  
HEALTH AND THE MINE SAFETY AND HEALTH  
ADMINISTRATION (NIOSH-MSHA).  
PROTECTIVE CLOTHES.....IMPERVIOUS GLOVES AND CLOTHING TO PREVENT SKIN  
CONTACT.  
EYE AND FACE PROTECTION.....DUST OR SPLASH PROOF CHEMICAL SAFETY GOGGLES OR  
FACE SHIELDS (EIGHT-INCH MINIMUM).  
OTHER PROTECTIVE EQUIPMENT..WHERE THERE IS ANY POSSIBILITY THAT AN  
EMPLOYEE'S EYES MAY BE EXPOSED TO THIS  
SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE  
WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA  
FOR EMERGENCY USE.  
WHERE THERE IS ANY POSSIBILITY THAT AN  
EMPLOYEE'S SKIN MAY BE EXPOSED TO THIS  
SUBSTANCE, THE EMPLOYER SHOULD PROVIDE A QUICK  
DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA  
FOR EMERGENCY USE.  
EMPLOYEES SHOULD BE TRAINED IN EMERGENCY  
MEASURES IN CASE OF LEAK, SPILL, FIRE OR  
EXPLOSION. TRAINING IN USE OF EMERGENCY  
RESPONSE EQUIPMENT SHOULD BE PROVIDED TO  
INCLUDE LOCATION OF PHONE, FIRST AID KITS,  
ALARMS, FIRE EXTINGUISHERS FOR THE SPECIFIC  
WORKPLACE.  
VENTILATION.....USE LOCAL EXHAUST AND PROCESS ENCLOSURE TO  
CONTROL DUSTS OR VAPORS. USE OF A  
CORROSION-RESISTANT VENTILATION SYSTEM IS  
RECOMMENDED.

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## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

VAPOR DENSITY (AIR=1).....NO DATA  
FREEZING/MELTING POINT.....NO DATA  
PHYSICAL STATE.....SOLID  
ODOR.....ODORLESS  
COLOR.....WHITE CRYSTALLINE  
ODOR THRESHOLD (PPM).....NO DATA  
VOLATILES % VOLUME.....NOT APPLICABLE  
EVAPORATION RATE (BUTYL  
ACETATE=1.0).....NOT APPLICABLE  
SPECIFIC GRAVITY  
(WATER=1.0).....0.97  
MOLECULAR WEIGHT.....324.0  
ACID/ALKALINITY (MEQ/G).....UNKNOWN  
PH.....10.0 - 11.0 (3% SOLUTION)  
VOC (EPA METHOD 24).....NOT APPLICABLE  
SOLUBILITY IN ORGANIC  
SOLVENTS.....NO DATA  
BOILING POINT.....NO DATA  
VAPOR PRESSURE MM/HG

(20°C).....NO DATA  
SOLUBILITY IN WATER (20°C)..120 g/L  
OCTANOL/WATER PARTITION  
COEFFICIENT.....NO DATA

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## SECTION 10: STABILITY AND REACTIVITY

STABILITY.....STABLE AS SOLID  
HAZARDOUS POLYMERIZATION....WILL NOT OCCUR  
HAZARDOUS THERMAL  
DECOMPOSITION/COMBUSTION  
PRODUCTS.....OXYGEN  
INCOMPATIBILITY  
(MATERIALS TO AVOID).....BASES  
FLAMMABLE AND COMBUSTIBLE MATERIALS, NITROGEN  
COMPOUNDS, ACIDS, METAL OXIDES AND MOISTURE.  
CONDITIONS TO AVOID.....CONTACT WITH INCOMPATIBLE SUBSTANCES.  
EXPOSURE TO INTENSE HEAT  
MOISTURE  
HIGH TEMPERATURES  
AVOID CONTACT WITH ALL COMBUSTIBLE MATERIALS.

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## SECTION 11: TOXICOLOGICAL INFORMATION

LD50 ORAL.....2400 mg/kg RAT  
2200 mg/kg MOUSE  
LD50 DERMAL.....NO DATA  
LC50 INHALATION.....NO DATA  
OTHER.....NO DATA  
AMES TEST RESULTS.....NO DATA AVAILABLE COVERING AMES TEST RESULTS

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## SECTION 12: ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL  
INFORMATION.....NO DATA AT THIS TIME  
CHEMICAL FATE INFORMATION...NO DATA AT THIS TIME

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## SECTION 13: DISPOSAL CONSIDERATION



DISPOSAL METHOD.....IN ACCORDANCE WITH FEDERAL, STATE, LOCAL  
REGULATIONS  
REPORTABLE QUANTITY.....MAY MEET THE REQUIREMENTS OF IGNITABLE WASTE  
0001.

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SECTION 14: TRANSPORT INFORMATION

DOT SHIPPING NAME .....SODIUM CARBONATE PEROXYHYDRATE  
DOT HAZARD CLASS .....5.1  
DOT LABELS .....OXIDIZER  
UN NUMBER .....UN 3378  
PLACARDS .....OXIDIZER  
IATA .....NOT REGULATED  
IMO/MDG .....NOT REGULATED  
TRANSPORT EMERGENCY  
PROCEDURES .....CONTACT CHEMTREC 1-800-424-9300  
OTHER .....NOT APPLICABLE

---

SECTION 15: REGULATORY INFORMATION

SARA SECTION 302.....YES  
SARA (313) CHEMICALS.....NO  
EPA TSCA INVENTORY.....APPEARS  
CERCLA SECTION 103.....NO  
CANADIAN WHMIS  
CLASSIFICATION.....C, D2B  
CANADIAN DOMESTIC  
SUBSTANCES LIST (DSL).....APPEARS  
CALIFORNIA PROPOSITION 65...NO  
EINECS INVENTORY.....APPEARS  
OTHER.....THIS PRODUCT IS REGULATED BY THE FOLLOWING  
STATES:  
CA; FL; MA; MN; NJ; PA

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SECTION 16: ADDITIONAL INFORMATION

DISCLAIMER.....THIS MATERIAL SAFETY DATA SHEET WAS PRODUCED  
FROM RELIABLE SOURCES. HOWEVER, IT IS PROVIDED  
WITHOUT REPRESENTATION OR WARRANTY EXPRESSED OR  
IMPLIED REGARDING ACCURACY OR CORRECTNESS.  
CONDITIONS AND METHODS OF USE ARE BEYOND THE  
CONTROL AND KNOWLEDGE OF CHEMICAL SPECIALTY GROUP, INC.

CHEMICAL SPECIALTY GROUP, INC. DOES NOT ASSUME ANY  
RESPONSIBILITY AND EXPRESSLY DISCLAIMS  
LIABILITY FOR INJURY, LOSS, DAMAGE OR EXPENSES  
ARISING FROM THE USE OF THIS PRODUCT.

ABBREVIATIONS USED..... ABBREVIATIONS USED THROUGHOUT THIS MSDS ARE:  
ACGIH = AMERICAN CONFERENCE OF GOVERNMENTAL  
INDUSTRIAL HYGIENISTS  
TWA = TIME WEIGHTED AVERAGE (EXPOSURE VALUES)  
STEL = SHORT TERM EXPOSURE LIMITS  
OSHA = OCCUPATIONAL SAFETY AND HEALTH  
ADMINISTRATION  
PEL = PERMITTED EXPOSURE LIMITS  
ppm = PARTS PER MILLION  
mg = MILLIGRAMS  
NIOSH = NATIONAL INSTITUTE FOR OCCUPATIONAL  
HEALTH AND SAFETY  
MSHA = MINE SAFETY AND HEALTH ADMINISTRATION  
lb = POUNDS  
m3 = PER METRE CUBED  
NTP = NATIONAL TOXICOLOGICAL PROGRAM  
g = GRAMS  
ml = MILLILITRE  
RTECS = REGISTRY OF TOXICS EFFECTS OF CHEMICAL  
SUBSTANCES (NIOSH)

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#### SECTION 17: LABEL INFORMATION

WARNING/PRECAUTIONS..... PRODUCT IS WHITE HYGROSCOPIC CRYSTALS.  
OXIDIZER. MAY BE HARMFUL OR FATAL IF SWALLOWED  
OR INHALED. MAY CAUSE SEVERE EYE AND  
RESPIRATORY TRACT IRRITATION OR BURNS. MAY  
CAUSE SKIN IRRITATION. CONTACT WITH OTHER  
MATERIALS MAY CAUSE FIRE.

FOR FURTHER INFORMATION..... SEE THE MATERIAL SAFETY DATA SHEET

SUPPLIER..... CHEMICAL SPECIALTY GROUP, INC.  
20 BUCKINGHAM COURT  
CARTERSVILLE, GA 30120  
TELE 770-386-3555 FAX 770-386-2009

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# MATERIAL SAFETY DATA SHEET

Klozür™



MSDS Ref. No.: 7775-27-1-12  
Date Approved: 02/22/2005  
Revision No.: 1

This document has been prepared to meet the requirements of the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200; the Canada's Workplace Hazardous Materials Information System (WHMIS) and, the EC Directive, 2001/58/EC.

## 1. PRODUCT AND COMPANY IDENTIFICATION

<b>PRODUCT NAME:</b>	Klozür™
<b>SYNONYMS:</b>	Sodium Persulfate, Sodium Peroxydisulfate; Disodium Peroxydisulfate
<b>GENERAL USE:</b>	In situ and ex situ chemical oxidation of contaminants and compounds of concern for environmental remediation applications.

### MANUFACTURER

FMC CORPORATION  
Active Oxidants Division  
1735 Market Street  
Philadelphia, PA 19103  
(215) 299-6000 (General Information)

### EMERGENCY TELEPHONE NUMBERS

(800) 424-9300 (CHEMTREC - U.S.)  
(303) 595-9048 (Medical - Call Collect)

## 2. HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW:

- White, odorless, crystals
- Oxidizer.
- Decomposes in storage under conditions of moisture (water/water vapor) and/or excessive heat causing release of oxides of sulfur and oxygen that supports combustion. Decomposition could form a high temperature melt. See Section 10 ("Stability and Reactivity").

**POTENTIAL HEALTH EFFECTS:** Airborne persulfate dust may be irritating to eyes, nose, lungs, throat and skin upon contact. Exposure to high levels of persulfate dust may cause difficulty in breathing in sensitive persons.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS#	Wt. %	EC No.	EC Class
Sodium Persulfate	7775-27-1	>99	231-892-1	Not classified as hazardous

4. FIRST AID MEASURES

**EYES:** Flush with plenty of water. Get medical attention if irritation occurs and persists.

**SKIN:** Wash with plenty of soap and water. Get medical attention if irritation occurs and persists.

**INGESTION:** Rinse mouth with water. Dilute by giving 1 or 2 glasses of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.

**INHALATION:** Remove to fresh air. If breathing difficulty or discomfort occurs and persists, contact a medical doctor.

**NOTES TO MEDICAL DOCTOR:** This product has low oral toxicity and is not irritating to the eyes and skin. Flooding of exposed areas with water is suggested, but gastric lavage or emesis induction for ingestions must consider possible aggravation of esophageal injury and the expected absence of system effects. Treatment is controlled removal of exposure followed by symptomatic and supportive care.

5. FIRE FIGHTING MEASURES

**EXTINGUISHING MEDIA:** Deluge with water.

**FIRE / EXPLOSION HAZARDS:** Product is non-combustible. On decomposition releases oxygen which may intensify fire. Presence of water accelerates decomposition.

**FIRE FIGHTING PROCEDURES:** Do not use carbon dioxide or other gas filled fire extinguishers; they will have no effect on decomposing persulfates. Wear full protective clothing and self-contained breathing apparatus.

**FLAMMABLE LIMITS:** Non-combustible

**SENSITIVITY TO IMPACT:** No data available



**SENSITIVITY TO STATIC DISCHARGE:** Not available

6. ACCIDENTAL RELEASE MEASURES

**RELEASE NOTES:** Spilled material should be collected and put in approved DOT container and isolated for disposal. Isolated material should be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water and dispose as a hazardous waste. All disposals should be carried out according to regulatory agencies procedures.

7. HANDLING AND STORAGE

**HANDLING:** Use adequate ventilation when transferring product from bags or drums. Wear respiratory protection if ventilation is inadequate or not available. Use eye and skin protection. Use clean plastic or stainless steel scoops only.

**STORAGE:** Store (unopened) in a cool, clean, dry place away from point sources of heat, e.g. radiant heaters or steam pipes. Use first in, first out storage system. Avoid contamination of opened product. In case of fire or decomposition (fuming/smoking) deluge with plenty of water to control decomposition. For storage, refer to NFPA Bulletin 430 on storage of liquid and solid oxidizing materials.

**COMMENTS:** VENTILATION: Provide mechanical general and/or local exhaust ventilation to prevent release of dust into work environment. Spills should be collected into suitable containers to prevent dispersion into the air.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS

Chemical Name	ACGIH	OSHA	Supplier
Sodium Persulfate	0.1 mg/m <sup>3</sup> (TWA)		

**ENGINEERING CONTROLS:** Provide mechanical local general room ventilation to prevent release of dust into the work environment. Remove contaminated clothing immediately and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT

**EYES AND FACE:** Use cup type chemical goggles. Full face shield may be used.

**RESPIRATORY:** Use approved dust respirator when airborne dust is expected.

**PROTECTIVE CLOTHING:** Normal work clothes. Rubber or neoprene footwear.

**GLOVES:** Rubber or neoprene gloves. Thoroughly wash the outside of gloves with soap and water prior to removal. Inspect regularly for leaks.

9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR:	None
APPEARANCE:	White crystals
AUTOIGNITION TEMPERATURE:	Not applicable. No evidence of combustion up to 800°C. Decomposition will occur upon heating.
BOILING POINT:	Not applicable
COEFFICIENT OF OIL / WATER:	Not applicable
DENSITY / WEIGHT PER VOLUME:	Not available
EVAPORATION RATE:	Not applicable (Butyl Acetate = 1)
FLASH POINT:	Non-combustible
MELTING POINT:	Decomposes
ODOR THRESHOLD:	Not applicable
OXIDIZING PROPERTIES:	Oxidizer
PERCENT VOLATILE:	Not applicable
pH:	typically 5.0 - 7.0 @ 25 °C (1% solution)
SOLUBILITY IN WATER:	73 % @ 25 °C (by wt.)
SPECIFIC GRAVITY:	2.6 (H <sub>2</sub> O=1)
VAPOR DENSITY:	Not applicable (Air = 1)
VAPOR PRESSURE:	Not applicable

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID:	Heat, moisture and contamination.
STABILITY:	Stable (becomes unstable in presence of heat, moisture and/or contamination).
POLYMERIZATION:	Will not occur
INCOMPATIBLE MATERIALS:	Acids, alkalis, halides (fluorides, chlorides, bromides and iodides), combustible materials, most metals and heavy metals, oxidizable materials, other oxidizers, reducing agents, cleaners, and organic or carbon containing compounds. Contact

with incompatible materials can result in a material decomposition or other uncontrolled reactions.

**HAZARDOUS DECOMPOSITION PRODUCTS:** Oxygen that supports combustion and oxides of sulfur.

**COMMENTS:** PRECAUTIONARY STATEMENT: Pumping and transport of Kloziir persulfate requires appropriate precautions and design considerations for pressure and thermal relief.

Decomposing persulfates will evolve large volumes of gas and/or vapor, can accelerate exponentially with heat generation, and create significant and hazardous pressures if contained and not properly controlled or mitigated.

Use with alcohols in the presence of water has been demonstrated to generate conditions that require rigorous adherence to process safety methods and standards to prevent escalation to an uncontrolled reaction.

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## 11. TOXICOLOGICAL INFORMATION

**EYE EFFECTS:** Non-irritating (rabbit) [FMC Study Number: ICG/T-79.029]

**SKIN EFFECTS:** Non-irritating (rabbit) [FMC Study Number: ICG/T-79.029]

**DERMAL LD<sub>50</sub>:** > 10 g/kg [FMC Study Number: ICG/T-79.029]

**ORAL LD<sub>50</sub>:** 895 mg/kg (rat) [FMC Study Number: ICG/T-79.029]

**INHALATION LC<sub>50</sub>:** 5.1 mg/l (rat) [FMC I95-2017]

**SENSITIZATION:** May be sensitizing to allergic persons. [FMC Study Number: ICG/T-79.029]

**TARGET ORGANS:** Eyes, skin, respiratory passages

**ACUTE EFFECTS FROM OVEREXPOSURE:** Dust may be harmful and irritating. May be harmful if swallowed.

**CHRONIC EFFECTS FROM OVEREXPOSURE:** Sensitive persons may develop dermatitis and asthma [Respiration 38:144, 1979]. Groups of male and female rats were fed 0, 300 or 3000 ppm sodium persulfate in the diet for 13 weeks, followed by 5000 ppm for 5 weeks. Microscopic examination of tissues revealed some injury to the gastrointestinal tract at the high dose (3000 ppm) only. This effect is not unexpected for an oxidizer at high concentrations. [Ref. FMC I90-1151, Toxicologist 1:149, 1981].

CARCINOGENICITY:

NTP:	Not listed
IARC:	Not listed
OSHA:	Not listed
OTHER:	ACGIH: Not listed

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION:

Bluegill sunfish, 96-hour LC<sub>50</sub> = 771 mg/L [FMC Study I92-1250]  
Rainbow trout, 96-hour LC<sub>50</sub> = 163 mg/L [FMC Study I92-1251]  
Daphnia, 48-hour LC<sub>50</sub> = 133 mg/L [FMC Study I92-1252]  
Grass shrimp, 96-hour LC<sub>50</sub> = 519 mg/L [FMC Study I92-1253]

**CHEMICAL FATE INFORMATION:** Biodegradability does not apply to inorganic substances.

13. DISPOSAL CONSIDERATIONS

**DISPOSAL METHOD:** Dispose as a hazardous waste in accordance with local, state and federal regulatory agencies.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

PROPER SHIPPING NAME:	Sodium Persulfate
PRIMARY HAZARD CLASS / DIVISION:	5.1 (Oxidizer)
UN/NA NUMBER:	UN 1505
PACKING GROUP:	III
LABEL(S):	5.1 (Oxidizer)
PLACARD(S):	5.1 (Oxidizer)
MARKING(S):	Sodium Persulfate, UN 1505
ADDITIONAL INFORMATION:	Hazardous Substance/RQ: Not applicable



49 STCC Number: 4918733  
This material is shipped in 225 lb. fiber drums, 55 lb. poly bags and 1000 - 2200 lb. IBC's (supersacks).

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

PROPER SHIPPING NAME: Sodium Persulfate

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) /  
INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

PROPER SHIPPING NAME: Sodium Persulfate

OTHER INFORMATION:  
Protect from physical damage. Do not store near acids, moisture or heat.

15. REGULATORY INFORMATION

UNITED STATES

- SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
- SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355, APPENDIX A):  
Not applicable
- SECTION 311 HAZARD CATEGORIES (40 CFR 370):  
Fire Hazard, Immediate (Acute) Health Hazard
- SECTION 312 THRESHOLD PLANNING QUANTITY (40 CFR 370):  
The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lbs; however, this product contains the following ingredients with a TPQ of less than 10,000 lbs.:  
None
- SECTION 313 REPORTABLE INGREDIENTS (40 CFR 372):  
Not listed
- CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)
- CERCLA DESIGNATION & REPORTABLE QUANTITIES (RQ) (40 CFR 302.4):  
Unlisted, RQ = 100 lbs., Ignitability
- TSCA (TOXIC SUBSTANCE CONTROL ACT)
- TSCA INVENTORY STATUS (40 CFR 710):

Listed

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)  
RCRA IDENTIFICATION OF HAZARDOUS WASTE (40 CFR 261):  
Waste Number: D001

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM):  
Product Identification Number: 1505  
Hazard Classification / Division: Class C (Oxidizer), Class D, Div. 2, Subdiv. B. (Toxic)  
Ingredient Disclosure List: Listed

INTERNATIONAL LISTINGS

Sodium persulfate:  
Australia (AICS): Listed  
China: Listed  
Japan (ENCs): (1)-1131  
Korea: KE-12369  
Philippines (PICCS): Listed

HAZARD, RISK AND SAFETY PHRASE DESCRIPTIONS:

EC Symbols: (Not classified as hazardous)  
EC Risk Phrases: (Not classified as hazardous)  
EC Safety Phrases: (Not classified as hazardous)

16. OTHER INFORMATION

HMIS

Health	1
Flammability	0
Physical Hazard	1
Personal Protection (PPE)	J

Protection = J (Safety goggles, gloves, apron & combination dust & vapor respirator)

HMIS = Hazardous Materials Identification System

Degree of Hazard Code:  
4 = Severe

3 = Serious  
2 = Moderate  
1 = Slight  
0 = Minimal

**NFPA**

Health	1
Flammability	0
Reactivity	1
Special	OX

SPECIAL = OX (Oxidizer)

NFPA = National Fire Protection Association

Degree of Hazard Code:  
4 = Extreme  
3 = High  
2 = Moderate  
1 = Slight  
0 = Insignificant

**REVISION SUMMARY:**  
New MSDS

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**SAFETY DATA SHEET**  
North American Version

**IXPER(R) 70C CALCIUM PEROXIDE GRANULES**

**1.1. Identification of the substance or preparation**

Product name : IXPER(R) 70C CALCIUM PEROXIDE GRANULES  
Molecular Weight : 72.1 g/mol

**1.2. Use of the Substance/Preparation**

Recommended use : - Oxidising Agents  
- Chemical industry  
- Agriculture industry  
- Soil remediation  
- For further information, please contact: Supplier

**1.3. Company/Undertaking Identification**

Address : SOLVAY CHEMICALS, INC.  
3333 RICHMOND AVENUE  
HOUSTON TX 77098-3099  
United States

**1.4. Emergency and contact telephone numbers**

Emergency telephone : 1 (800) 424-9300 CHEMTREC ® (USA & Canada)  
01-800-00-214-00 (MEX. REPUBLIC)

Contact telephone number : US: +1-800-765-8292 (Product information)  
(product information): US: +1-713-525-6500 (Product information)

**2.1. Emergency Overview:**

NFPA : H= 2 F= 0 I= 1 S= OX  
HMIS : H= 2 F= 0 R= 1 PPE = Supplied by User; dependent on local conditions

**General Information**

Appearance : Granular  
Colour : light yellow  
Odour : odourless

**Main effects**

- The preparation is classified as dangerous in accordance with Directive 1999/45/EC.
- Oxidising
- Contact with combustible material may cause fire.
- Irritating to respiratory system and skin.
- Risk of serious damage to eyes.





## 2.2. Potential Health Effects:

### *Inhalation*

- irritation of the upper respiratory tract
- Irritating to mucous membranes
- Repeated or prolonged exposure: Risk of sore throat, nose bleeds.
- (in case of higher concentration): Cough.

### *Eye contact*

- Severe eye irritation
- Lachrymation
- Redness
- Swelling of tissue
- Risk of serious damage to eyes.

### *Skin contact*

- Prolonged skin contact may cause skin irritation.

### *Ingestion*

- Severe irritation
- Irritation of the mouth and throat.
- Symptoms: Nausea, Abdominal pain, Vomiting, Diarrhoea.

### *Other toxicity effects*

- See section 11: Toxicological Information

## 2.3. Environmental Effects:

- See section 12: Ecological Information

### Calcium peroxide

CAS-No. : 1305-79-9  
Concentration :  $\geq 70.0\%$

### Calcium dihydroxide

CAS-No. : 1305-62-0  
Concentration :  $\geq 10.0 - \leq 25.0\%$

### Other inorganic calcium compounds

CAS-No. : Proprietary  
Concentration :  $\geq 10.0 - \leq 25.0\%$

## 4.1. Inhalation

- Remove the subject from dusty environment and let him blow his nose.
- If symptoms persist, call a physician.

## 4.2. Eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- In the case of difficulty of opening the lids, administer an analgesic eye wash (oxybuprocaine).
- Consult with an ophthalmologist immediately in all cases.

## 4.3. Skin contact

- Remove and wash contaminated clothing before re-use.
- Wash off with plenty of water.
- If symptoms persist, call a physician.

#### 4.4. Ingestion

- Call a physician immediately.

*If victim is conscious:*

- If swallowed, rinse mouth with water (only if the person is conscious).
- Do NOT induce vomiting.

*If victim is unconscious but breathing:*

- Artificial respiration and/or oxygen may be necessary.

#### 5.1. Suitable extinguishing media

- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Water
- Water spray

#### 5.2. Extinguishing media which shall not be used for safety reasons

- None.

#### 5.3. Special exposure hazards in a fire

- Oxidising
- Oxygen released in thermal decomposition may support combustion
- Contact with combustible material may cause fire.
- Contact with flammables may cause fire or explosions.
- Risk of explosion if heated under confinement.

#### 5.4. Hazardous decomposition products

- Oxygen

#### 5.5. Special protective equipment for fire-fighters

- In the event of fire, wear self-contained breathing apparatus.
- Fire fighters must wear fire resistant personnel protective equipment.

#### 5.6. Other information

- Keep product and empty container away from heat and sources of ignition.

#### 6.1. Personal precautions

- Refer to protective measures listed in sections 7 and 8.
- Keep away from incompatible products

#### 6.2. Environmental precautions

- Should not be released into the environment.
- If the product contaminates rivers and lakes or drains inform respective authorities.

#### 6.3. Methods for cleaning up

- Do not add chemical products.
- Pick up and arrange disposal without creating dust.
- All receiving equipment should be clean, vented, dry, labelled and made of material that is compatible with the product.
- Flush with plenty of water.
- Treat recovered material as described in the section "Disposal considerations".

#### 7.1. Handling

- Clean and dry piping circuits and equipment before any operations.
- Never return unused material to storage receptacle.
- Containers and equipment used to handle the product should be used exclusively for that product.
- Keep away from heat and sources of ignition.
- Keep away from incompatible products.

#### 7.2. Storage

- Keep in a dry place.
- Keep in a cool, well-ventilated place.
- Keep away from direct sunlight.
- Keep away from heat.
- Keep away from incompatible products.
- The container must be used exclusively for the product.
- Keep in container fitted with safety valve or vent.

#### 7.3. Packaging material

- Stainless steel
- Plastic material
- glass

#### 7.4. Other information

- Avoid dust formation.
- Refer to protective measures listed in sections 7 and 8.
- In industrial installations, apply the rules for the prevention of major accidents (consult an expert).
- Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

#### 8.1. Exposure Limit Values

##### Calcium peroxide

- SAEL (Solvay Acceptable Exposure Limit) 2007  
TWA = 3 mg/m3

##### Calcium dihydroxide

- US. ACGIH Threshold Limit Values 01 2006  
time weighted average = 5 mg/m3
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006  
Permissible exposure limit = 5 mg/m3  
Remarks: respirable dust fraction
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006  
Permissible exposure limit = 15 mg/m3  
Remarks: Total dust
- US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989  
time weighted average = 5 mg/m3
- US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008  
time weighted average = 5 mg/m3  
Remarks: respirable dust fraction
- US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008  
time weighted average = 15 mg/m3  
Remarks: Total dust

##### Calcium carbonate

- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006  
Permissible exposure limit = 5 mg/m3



- Remarks: respirable dust fraction
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006  
Permissible exposure limit = 15 mg/m3  
Remarks: Total dust
  - US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989  
time weighted average = 5 mg/m3  
Remarks: respirable dust fraction
  - US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989  
time weighted average = 15 mg/m3  
Remarks: Total dust
  - US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008  
time weighted average = 15 mg/m3  
Remarks: Total dust
  - US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008  
time weighted average = 5 mg/m3  
Remarks: respirable dust fraction

ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists.  
SAEL = Solvay Acceptable Exposure Limit, Time Weighted Average for 8 hour workdays. No Specific TLV STEL (Short Term Exposure Level) has been set. Excursions in exposure level may exceed 3 times the TLV TWA for no more than a total of 30 minutes during a workday and under no circumstances should they exceed 5 times the TLV TWA.

**8.2. Engineering controls**

- Ensure adequate ventilation.
- Refer to protective measures listed in sections 7 and 8.
- Apply technical measures to comply with the occupational exposure limits.

**8.3. Personal protective equipment**

- 8.3.1. Respiratory protection**
- Use only respiratory protection that conforms to international/ national standards.
  - Use NIOSH approved respiratory protection.
- 8.3.2. Hand protection**
- Wear suitable gloves.
- 8.3.3. Eye protection**
- Chemical resistant goggles must be worn.
- 8.3.4. Skin and body protection**
- Protective suit
- 8.3.5. Hygiene measures**
- Use only in an area equipped with a safety shower.
  - Eye wash bottle with pure water
  - Handle in accordance with good industrial hygiene and safety practice for diagnostics.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

**9.1. General Information**

Appearance : Granular  
Colour : light yellow  
Odour : odourless

**9.2. Important health safety and environmental information**

pH : 11.7



	Remarks: saturated aqueous solution Concentration: 10 g/l Temperature: 20 °C ( 68 °F )
Boiling point/boiling range	: Remarks: not applicable
Flash point	: Remarks: not applicable
Flammability	: Remarks: The product is not flammable.
Explosive properties	: <u>Explosion danger:</u> Remarks: Not explosive
Oxidizing properties	: Remarks: Oxidising
Vapour pressure	: Remarks: not applicable
Relative density / Density	: 2.92
Bulk density	: 500 kg/m3
Solubility	: Water 1.65 g/l (calcium hydroxide) Temperature: 20 °C ( 68 °F ) : slightly soluble : Remarks: Decomposes in contact with water.
Partition coefficient: n-octanol/water	: Remarks: not applicable
Vapour density	: Remarks: not applicable

### 9.3. Other data

Melting point/range	: 275 °C ( 527 °F ) Remarks: Decomposition
Decomposition temperature	: > 275 °C ( 527 °F )

## 10. STABILITY AND REACTIVITY

### 10.1. Stability

- Stable under recommended storage conditions.

### 10.2. Conditions to avoid

- Exposure to moisture.
- Keep at temperature not exceeding: 275 °C ( 527 °F )

### 10.3. Materials to avoid

- Water, Acids, Bases, Heavy metal salts, Reducing agents, Organic materials, Flammable materials

### 10.4. Hazardous decomposition products

- Oxygen

## Toxicological data

### Acute oral toxicity

- LD50, rat, > 2,000 mg/kg

**Acute inhalation toxicity**

- LC50, rat, > 5,000 mg/m3

**Acute dermal irritation/corrosion**

- LD50, rat, > 2,000 mg/kg

**Skin irritation**

- rabbit, No skin irritation

**Eye irritation**

- Risk of serious damage to eyes.

**Sensitisation**

- guinea pig, Did not cause sensitization on laboratory animals.

**Genetic toxicity in vitro**

- In vitro tests did not show mutagenic effects

**Remarks**

- Risk of serious damage to eyes.

**12.1. Ecotoxicity effects**

**Acute toxicity**

- Fishes, Cyprinus carpio, LC50, 48 h, 160 mg/l
- Crustaceans, Daphnia sp., EC50, 24 h, 25.6 mg/l

**12.2. Mobility**

- Air

Remarks: not applicable

- Water

Remarks: low solubility and mobility

- Soil/sediments

Remarks: no data available

**12.3. Persistence and degradability**

**Abiotic degradation**

- Air

Result: not applicable

- Water/soil

Result: complexation/precipitation of inorganic materials

- Water

Result: non-significant hydrolysis

**Biodegradation**

- Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

**12.4. Bioaccumulative potential**

- Remarks: not applicable

**12.5. Other adverse effects**

- no data available

**12.6. Remarks**

- Hazard for the environment is limited due to product properties:
- Aquatic toxicity is unlikely due to low solubility.
- weak solubility and precipitation as carbonate or sulfate in aquatic environment.
- Does not bioaccumulate.

- Diluted product is rapidly neutralized at environmental pH.

**13.1. Waste from residues / unused products**

- Dilute with plenty of water.
- Dispose of wastes in an approved waste disposal facility.
- Can be landfilled, when in compliance with local regulations.
- In accordance with local and national regulations.

**13.2. Packaging treatment**

- Clean container with water.
- Empty containers should be taken to an approved waste handling site for recycling or disposal.
- Uncleaned empty packaging
- Dispose of as unused product.
- In accordance with local and national regulations.

**13.3. RCRA Hazardous Waste**

- Listed RCRA Hazardous Waste (40 CFR 302) - No
- Unlisted RCRA Hazardous Waste (40 CFR 302) - Yes
- D001 (ignitable waste)

**14. TRANSPORT INFORMATION**

<b>UN-Number</b>	<b>1457</b>
<b>IATA-DGR</b>	
Class	5.1
Packing group	II
ICAO-Labels	Oxidizer
<b>IMDG</b>	
Class	5.1
Packing group	II
ICAO-Labels	Oxidising agent
HI/UN No.	1457
<b>U.S. Dept of Transportation</b>	
Class (Subsidiary)	5.1
Packing group	II
Label (Subsidiary)	Oxidising agent
Emergency info:	ERG: 140
<b>Canada (TDG)</b>	
Class (Subsidiary)	5.1
Packing group	II
Label (Subsidiary)	Oxidizer
Emergency info:	ERG: 140



15.1. Inventory Information

Toxic Substance Control Act list (TSCA)	: -	In compliance with inventory.
Australian Inventory of Chemical Substances (AICS)	: -	In compliance with inventory.
Canadian Domestic Substances List (DSL)	: -	In compliance with inventory.
Korea Existing Chemicals Inv. (KECI) (KECI (KR))	: -	In compliance with inventory.
EU list of existing chemical substances (EINECS)	: -	In compliance with inventory.
Japan (ENCS) List (ENCS (JP))	: -	In compliance with inventory.
Inventory of Existing Chemical Substances (China) (IECS)	: -	In compliance with inventory.
Philippine Inventory of Chemicals and Chemical Substances (PICCS)	: -	In compliance with inventory.
New Zealand Inventory (in preparation) (NZ)	: -	In compliance with inventory.

15.2. Other regulations

*US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A)*  
- not regulated.

*SARA Hazard Designation (SARA 311/312)*  
- Acute Health Hazard: Yes.  
- Fire Hazard: Yes.

*US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required*  
- not regulated.

*US. EPA CERCLA Hazardous Substances (40 CFR 302)*  
- not regulated.

*US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)*  
- yes.

*US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)*  
- not regulated.

*US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)*  
- not regulated.

15.3. Classification and labelling

*Canada. Canadian Environmental Protection Act (CEPA). WHMIS Ingredient Disclosure List (Can. Gaz., Part II, Vol. 122, No. 2)*  
- C Oxidizing Material  
- D2B Toxic Material Causing Other Toxic Effects



Remarks: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

**EC Label**

- The product is classified and labelled in accordance with Directive 1999/45/EC.

Symbol(s)	O	Oxidising
	XI	Irritant
R-phrases(s)	R 8	Contact with combustible material may cause fire.
	R37/38	Irritating to respiratory system and skin.
	R41	Risk of serious damage to eyes.
S-phrases(s)	S 3	Keep in a cool place.
	S 8	Keep container dry.
	S17	Keep away from combustible material.
	S22	Do not breathe dust.
	S24/25	Avoid contact with skin and eyes.
	S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
	S37/39	Wear suitable gloves and eye/face protection.



**Ratings :**

**NFPA (National Fire Protection Association)**

Health = 2 Flammability = 0 Instability = 1 Special = OX

**HMIS (Hazardous Material Information System)**

Health = 2 Fire = 0 Reactivity = 1 PPE : Supplied by User; dependent on local conditions

**Further information**

- Update  
This data sheet contains changes from the previous version in section(s): 3, 7.5, 9.3, 10
- Distribute new edition to clients

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